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13. ABSTRACT (Maximum 200 words)

This document describes the Software Systems Reengineering Process Model, Version 2.0. The activities described in the Model compose the software reengineering process, including Define Project, Reverse Engineer, and Forward Engineer. The Model is represented using the IDEF0 Activity Modeling technique. The intended audience for the Model is any organization within DoD tasked to reengineer an automated information system (AIS). The Model can be obtained from the Defense Technical Information Center, (703) 274-7633.

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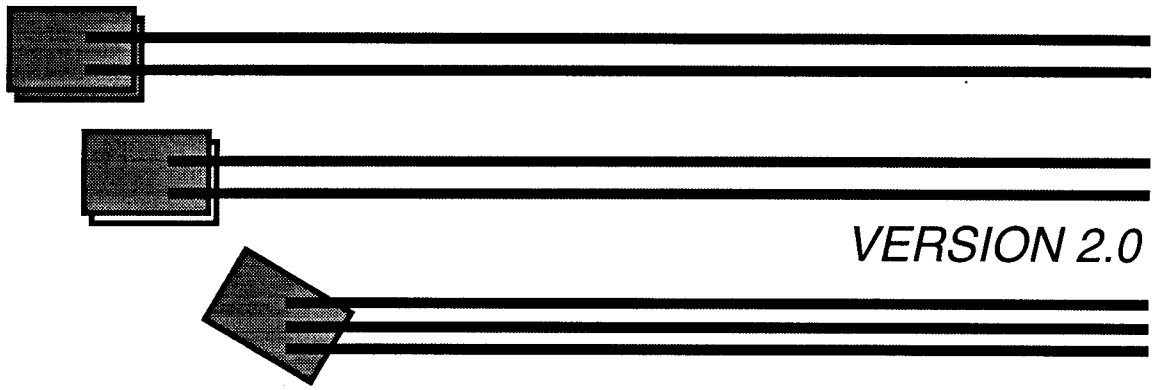
Software Systems Reengineering Process Model



VERSION 2.0

September 1994

Prepared by:

Software Systems Engineering Department
Software Engineering Technology Division

ACKNOWLEDGEMENT

This document was prepared by the Defense Information Systems Agency, Joint Interoperability and Engineering Organization (DISA/JIEO), Center for Software[1] (CFSW) sponsored by the Office of the Assistant Secretary of Defense (OASD) for Command, Control, Communications, and Intelligence (C^3I). The Center's Software Systems Engineering Department would like to thank the participants in the Software Systems Reengineering Process Model Technical Review for their contribution to the development of the Software Systems Reengineering Process Model, Version 2.0, September 1994. Representatives from the Department of Defense and Federally Funded Research and Development Centers (FFRDCs) met and reached consensus on the software reengineering process during this Technical Review held June 14-17, 1994. This consensus software reengineering process is captured in Version 2.0 of the Model as defined in this document. The Model is represented both graphically and textually and is intended for use by all DoD in planning and implementing software reengineering of automated information systems. The participants attending the Technical Review represented the following organizations:

Defense Finance and Accounting Services:
- Financial Systems Activity, Columbus, Oh
- Financial Systems Activity, Denver, Co
- Financial Systems Organization, Indianapolis, In

Defense Information Systems Agency, Joint Interoperability and Engineering Organization:
- Center for Standards, Reston, Va
- Center for Software, Arlington, Va:
  - Center for FPI Expertise
  - Planning and Integration Directorate
  - Software Reuse Program
  - Software Process Improvement Program
  - Software Reengineering Program

Defense Logistics Agency, Service Activity Center, Columbus, Oh

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[1]The Center for Software includes the organization formerly named the Center for Information Management in the Defense Information Systems Agency's Joint Interoperability and Engineering Organization.

Department of the Air Force:

- Air Force Military Personnel Center, Randolph AFB, Tx
- HQ CSC/SDQ, Tinker AFB, Ok
- MSC/SOE, Hill AFB, Ut
- USAF Software Technology Support Center, Hill AFB, Ut
- USAF Standard Systems Center (SAC/EN), Maxwell AFB-Gunter Annex, Al

Department of the Army:

- U.S. Army Information Systems Software Center, Fort Belvoir, Va
- U.S. Army Information System Software Command, Fort Lee, Va

Department of the Navy:

- Naval Undersea Warfare Center, New London, Ct
- Navy Fleet Materiel Support Office (FMSO), Mechanicsburg, Pa
- Navy Management Systems Support Office, Chesapeake, Va

Department of Defense, National Security Agency, Office of Information Technology Management, Fort Meade, Md

The Institute for Defense Analyses, Alexandria, Va

Marine Corps Logistics Base, Information Resources Managements Directorate, Albany, Ga

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Software Engineering Institute, Carnegie Mellon University, Pittsburgh, Pa

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FOREWORD

1. The Software Systems Reengineering Process Model is intended for use by all Departments and Agencies of the Department of Defense. This Model provides guidance for applying software reengineering technology for the development and modernization of automated information support within the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to:

Defense Information Systems Agency
Joint Interoperability and Engineering Organization
Center for Software
Software Systems Engineering Department
701 South Courthouse Road, Arlington, VA 22204-2199

3. The DoD Components may obtain copies of this document through their own publication channels. Defense Contractors, and other Federal Agencies may obtain copies from:

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4. This Model is not intended to specify or discourage the use of any particular software development method. The implementer of this model is responsible for selecting software development methods that best support the achievement of the software reengineering project goals. The Model represents a view of software reengineering that is independent of specific tools, methodologies, and domains.

5. This Model must be appropriately tailored by the project manager to ensure that the necessary and cost-effective activities of software reengineering are implemented. Assistance in tailoring this document is available from the Software Reengineering Program located at the address in paragraph 2 of this Foreword.

6. The Center for Software is chartered to support the Office of the Assistant Secretary of Defense (OASD) for Command, Control, Communications, and Intelligence (C^3I) by providing information management technical services to the DoD community. The services are an integral part of the Corporate Information Management program, a DoD-wide effort to streamline business operations and processes which will help improve the design of cost-effective, standard information systems.

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1. SCOPE

1.1 Purpose. The Center for Software's Software Systems Reengineering Process Model provides guidance for applying software reengineering technology for the development and migration of automated information systems (AISs) within the Department of Defense (DoD). The Center for Software is chartered to support the Office of the Assistant Secretary of Defense (C^3I) by providing information management technical services to the DoD community. The services are an integral part of the Corporate Information Management program, a DoD-wide effort to streamline business operations and processes which will help improve the design of cost-effective, standard information systems. This document introduces the reader to the software reengineering process composed of activities for creating AISs to support current business needs.

The Software Systems Reengineering Process Model captures the essence of software reengineering as it applies in the DoD Information Management (IM) community. Software reengineering is composed of activities supporting the development and maintenance of automated information systems based on the examination and utilization of existing software system resources. Reengineering emerges as a strategy for bringing the cost of developing and maintaining software under control. The need for a comprehensive plan to apply software reengineering technology is the driving force behind the Center's Software Reengineering Program. The Software Systems Reengineering Process Model will assist managers facing this situation.

1.2 Application. This Model is intended for use by all Departments and Agencies of the Department of Defense. This Model provides guidance for applying software reengineering technology for the development and modernization of automated information systems within the Department of Defense. Any part of the Model may be tailored and implemented to meet organizational goals through software reengineering technology.

1.2.1 Tailoring. This Model is intended to be tailored by the project manager to ensure that the necessary and cost-effective activities of software reengineering are implemented. A subset of this Model may be selected to meet the reengineering project objectives. The activities in this Model should be refined to the level where activities can be costed and products listed by name. These lowest level activities have one output product and one function to perform. Assistance in tailoring the Model is available from the Software Reengineering Program located at the address in the Foreword of this document.

1.3 Benefits. Two broad concepts guide software reengineering in the DoD. The first concept is the prevention of duplication by joint use of personnel, information systems, facilities, and services across DoD. The second concept is conformance to new regulations, policy, standards, and guidelines for software acquisition and support. The Model integrates the software reengineering process with the mechanisms provided by these available technologies that provide the software engineering environment and the regulations, policy, standards and guidelines governing software development and maintenance under DoD IM. Software reengineering is also explored as a means for improving the quality and reducing the cost associated with the development and maintenance of computer software systems.

The Technical Review held in June 1994 brought together representatives from organizations in the Department of Defense who are tasked with performing software reengineering or developing guidelines for how software reengineering should be applied in the DoD. These representatives reached consensus on a software reengineering process which is described in the Software Systems Reengineering Process Model, Version 2.0 defined in this document.

Only recently have there been reengineering efforts of the magnitude to produce data that is useful in predicting the success of reengineering. Some of these efforts have defined process models and were examined in preparation for defining the Software Systems Reengineering Process Model [ByGu92, ChCr90, HoMi91, MITR92, RuGu91].

1.4 Context. The software reengineering process for DoD AIS is defined by the process model described in this document. This process is composed of activities that examine existing software systems and utilize resources extracted from these systems to develop new AISs and modernize existing AISs. Figure 1 presents a frame of reference for this reengineering process. It relates software reengineering to other processes within the information management domain. For clarity, Figure 1 shows only major inputs and outputs and does not identify controls or mechanisms for information management.

Functional Process Improvement (FPI) drives the overall software reengineering process [DoD92a]. FPI guides managers to identify the current business needs and implement business process improvements. Reverse engineering is employed to obtain an accurate description of the current AIS environment. The functional requirements are forward engineered into new AISs according to appropriate standards. A process for performing reengineering is defined by the Software Systems Reengineering Process Model described in this paper.

FPI programs enable functional managers to identify current problems, including poor business practices, establish costs for business activities, propose changes and implement business improvements. Technical Improvement opportunities may result from technology changes identified in the Technical and Economic Analysis Process or operational experience with existing AISs. In addition, reverse engineered products, including business rules, process models, and data models, may be required if information on the existing business processes are not well documented.

Cost and quality improvement are often direct drivers of reengineering as they are primary forces behind FPI. The ability to support information management systems in a cost-effective manner and improve the quality of information management products are organizational goals that can be achieved through software reengineering. These two drivers may not be linked to FPI.

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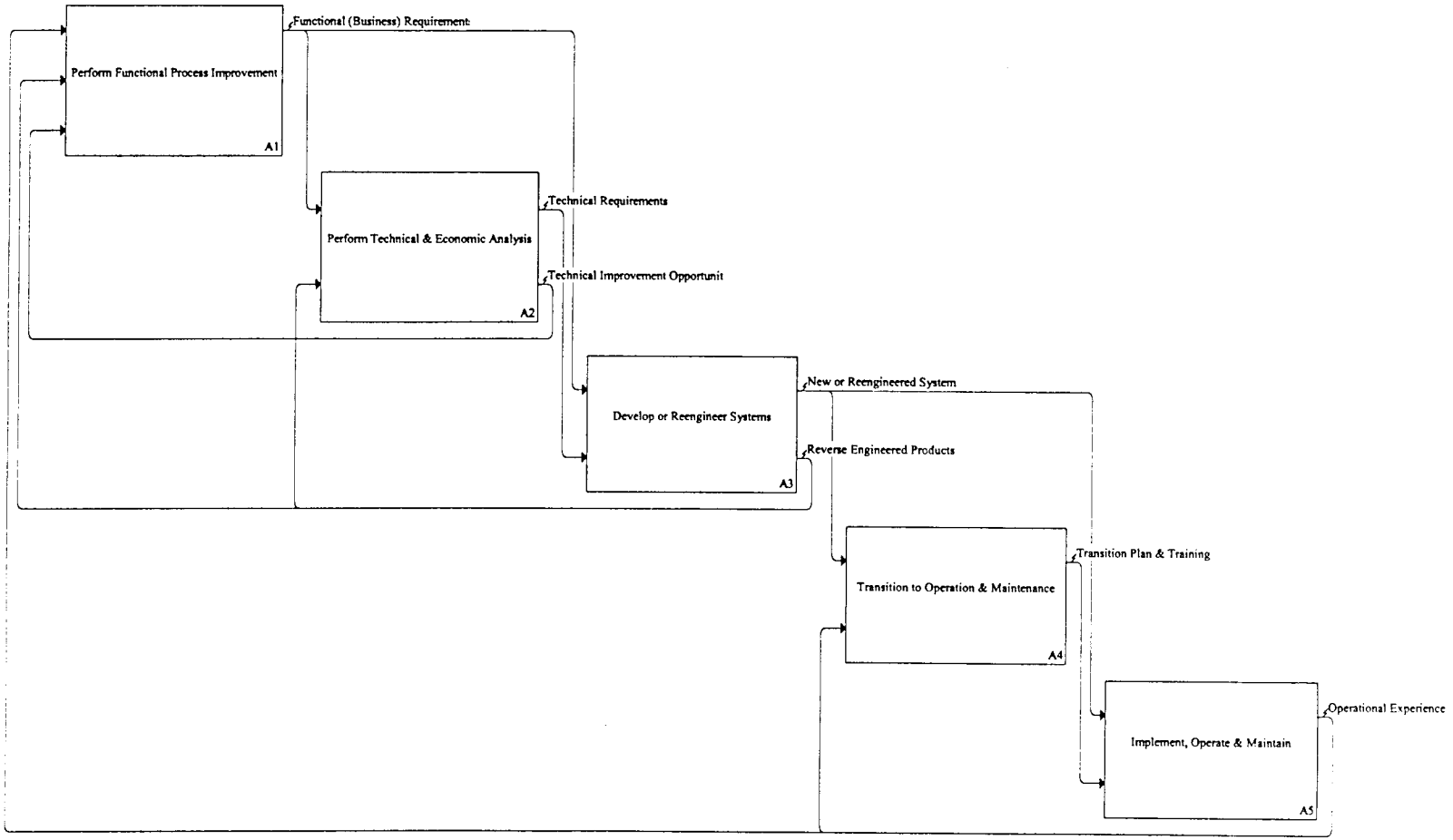

Node: A0 / C18	Title: Figure 1. Context for Information Management	Number: Pg 4

Technical and Economic Analysis is performed to determine the technical and economic feasibility of using AISs to support the business processes. Characteristics of the current AIS environment are compared with the functional requirements and available commercial technologies. Reverse engineered products may be required if an accurate description of the current AIS baseline does not exist. The technical analysis process produces recommendations on the use of technology and eventually an implementation plan.

The functional and technical requirements are then used to develop a new system or reengineer an existing system. New systems follow processes specified in existing military or commercial standards. The software reengineering process is defined in the Software Systems Reengineering Process Model. AISs are developed, reengineered, implemented, operated and maintained under configuration control.

1.5 Process Model Overview. The activities described in the Software Systems Reengineering Process Model capture the essence of the software reengineering process as it applies in the DoD IM community. This process is composed of three high-level activities, including Define Project (initial project planning), Reverse Engineer, and Forward Engineer. Figure 2 depicts a node tree which represents each activity of the Model as a node and shows how each activity is composed of subordinate activities.

This Model serves as a guide to performing software reengineering to develop and support automated information systems which implement functional and technical requirements, while in the context of the DoD Enterprise Model.

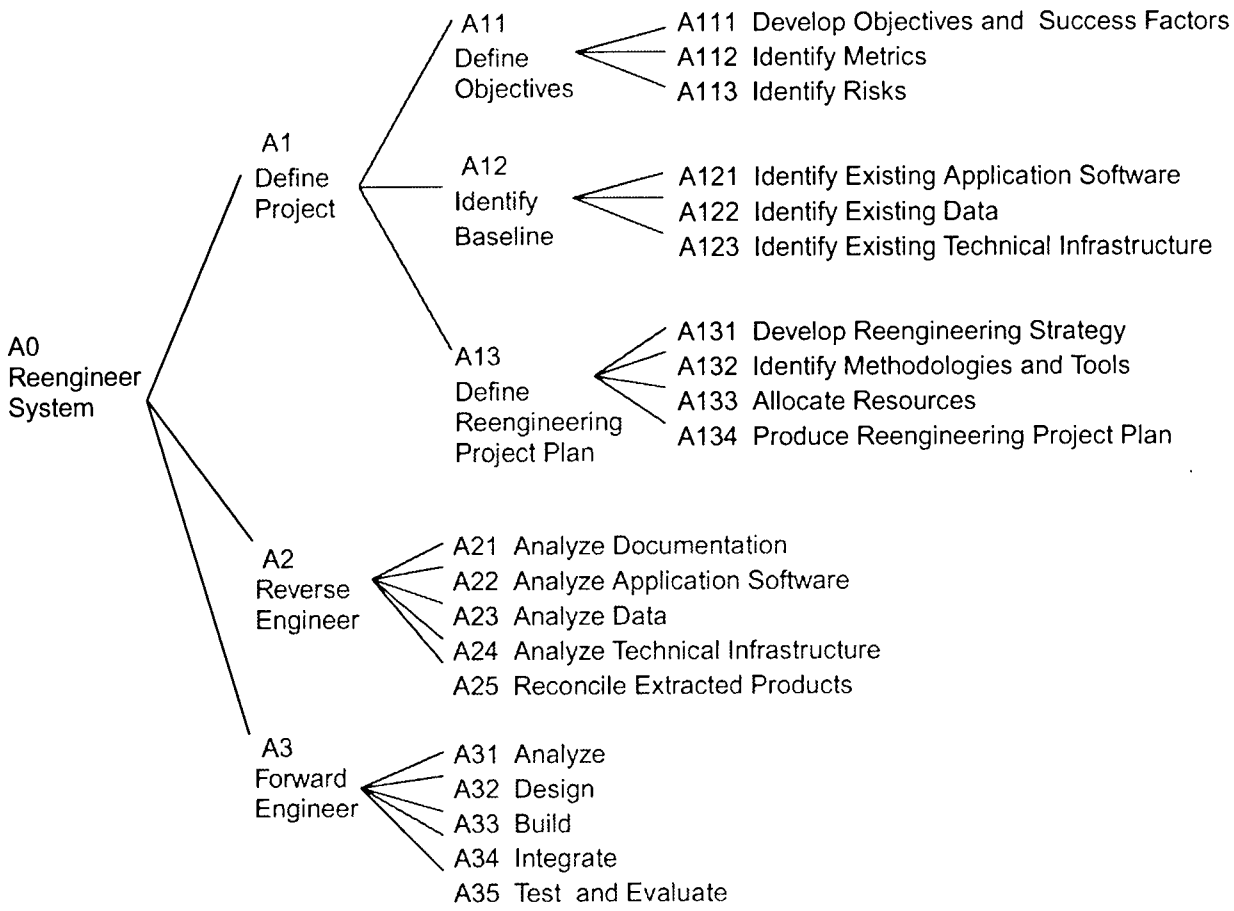

Figure 2. Software Systems Reengineering Process Model Node Tree

1.6 IDEF Function Modeling Overview. The Software Systems Reengineering Process Model is represented using the Integrated Computer-Aided Manufacturing (ICAM) DEFinition language (IDEF) for function modeling (IDEF0). IDEF was developed in the United States Air Force ICAM program. Today, the IDEF method is required for all function modeling [DoD92a]. IDEF0 is used to produce a functional model that is a structured representation of activities or functions and the relationship between those activities.

IDEF0 models are composed of activities ("what is done") and interfaces, including inputs, controls, outputs, and mechanisms (Figure 3). Activities are represented as boxes and the interfaces are depicted as arrows, entering and leaving the boxes. Inputs enter from the left and outputs leave from the right of the box; the activity transforms inputs to outputs. Controls enter at the top of the box; they provide direction and constraint. Mechanisms, representing the means used to perform the activity, enter from the bottom. Mechanisms may include, people, databases, or equipment that support or perform the activity.

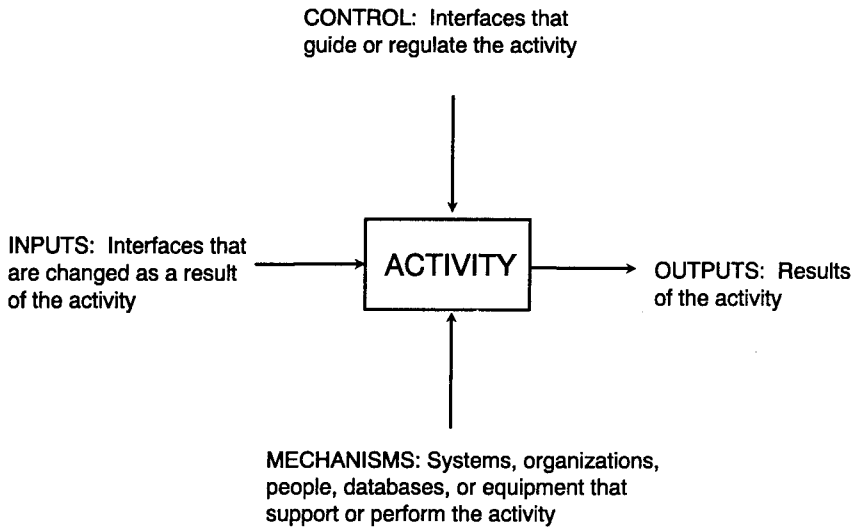

Figure 3. IDEF Activity Model

The organization of the IDEF0 activities and their relationships with each other are not related to, concerned with, or limited by time. These activities are refined into greater detail in subsequent diagrams.

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2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those most current.

DoD-STD-2167A	Defense System Software Development
DoD-STD-1703 (NS)	Software Product Standards
MIL-STD-7935A	DoD AIS Documentation Standards
MIL-STD-498 (Draft)	Software Development and Documentation
MIL-STD-1815A	Ada Programming language

2.1.2 Other Government documents, drawings, and publications.

[CIM93a] Information System Criteria for Applying Software Reengineering, Center for Information Management, DTIC reference AD-274699, May 1993.

[CIM93b] Software Systems Reengineering Process Model: Version 1.0, Center for Information Management, DTIC reference AD-275711, Aug 1993.

[CIM93c] Software Reengineering Risk Taxonomy Report, Center for Information Management, Sept 1993.

[DoD92a] Functional Management Process for Implementing the Information Management Program of the Department of Defense, DoD 8020.1-M (Draft), Aug 1992.

[DoD92b] DoD Technical Architecture Framework for Information Management (Architecture Guidance and Design Concepts), Version 1.1, Vol. 2, Center for Information Management, Arlington VA, Oct 1992.

[DoD92c] DoD 5000 11-M, DoD Data Administration Procedures, Defense Information Systems Agency, Arlington VA, Oct 1992.

[DoD92d] Defense Information Management (IM) Program, Department of Defense Directive 8000.1, May 18, 1992.

[DoD94] The DoD Enterprise Model, OASD(C3I)/DDI, 1225 Jefferson Davis Highway, Suite 910, Arlington VA 22202-4301, Jan 1994.

[HoMi91] R. L. Hobbs, J.R. Mitchell, and G.E. Racine, "System Re-engineering Project Executive Summary," ASQB-GI-92-003, Nov 1991.

[MITR92] MITRE Corporation, "Lessons Learned: Re-engineering the Weighted Airman Promotion System for the CIM Environment," MITRE Corporation, Reston VA, Sep 1992.

[RuGu91] M. K. Ruhl and M. T. Gunn, "Software Reengineering: A Case Study and Lessons Learned," NIST Special Publication 500-193, National Institute of Standards and Technology, Sep 1991.

2.2 Non-Government documents.

2.2.1 Non-Government standards.

FIPS 146-2	Government Open-Systems Interconnection Protocol (GOSIP)
FIPS 151-1	Portable Operating System Interface Exchange (POSIX)
FIPS 183	IDEF

IEEE STD 610.12 Institute of Electrical and Electronics Engineers, Inc., IEEE Standard Glossary of Software Engineering Terminology, IEEE Std 610.12-1990, Dec 10, 1990.

2.2.2 Other Non-Government documents, drawings, and publications.

[Basi93] V.R. Basili, Software Modeling and Measurement: The Goal/Question/Metric Paradigm, Institute for Advanced Computer Studies, Department of Computer Science, University of Maryland, developed under NASA/GSFC contract NSG-5123 and AFOSR contract 90-0031, 1993.

[ByGu92] E. J. Byrne and D. A. Gustafson, "A Software Reengineering Process Model," Conference on Computer Software and Applications (COMPSAC), Sep 1992, Chicago, IL.

[CMU92] Software Measurement for DoD Systems: Recommendations for Initial Core Measures, TR CMU/SEI-92-TR-19, Sep 1992.

[ChCr90] E. J. Chikofsky and J. H. Cross, "Reverse Engineering and Design Recovery: A Taxonomy," IEEE Software, pp. 13-17, Jan 1990.

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3. SOFTWARE SYSTEMS REENGINEERING PROCESS MODEL

The Model is composed of diagrams and a glossary of the activities and their inputs, controls, outputs, and mechanisms. This Section 3 presents each activity in a diagram. Each diagram shows all the inputs, controls, outputs, and mechanisms for each activity of the Model. An alphabetic listing of the definitions for all the activities and their inputs, outputs, controls, and mechanisms are contained in Section 4. GLOSSARY OF THE MODEL.

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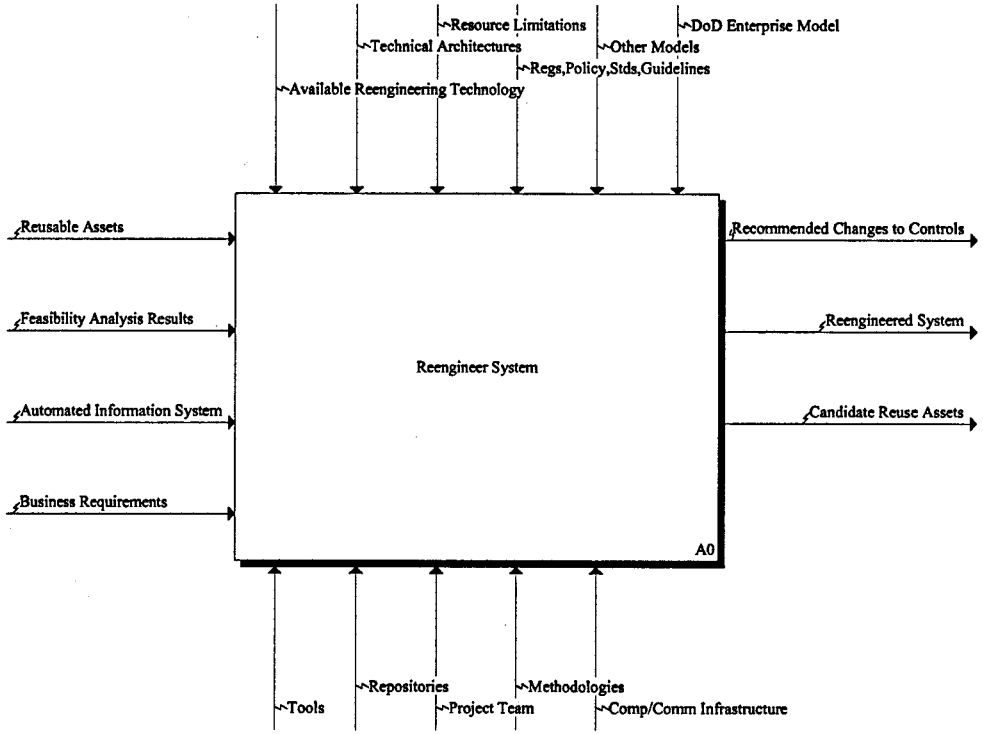

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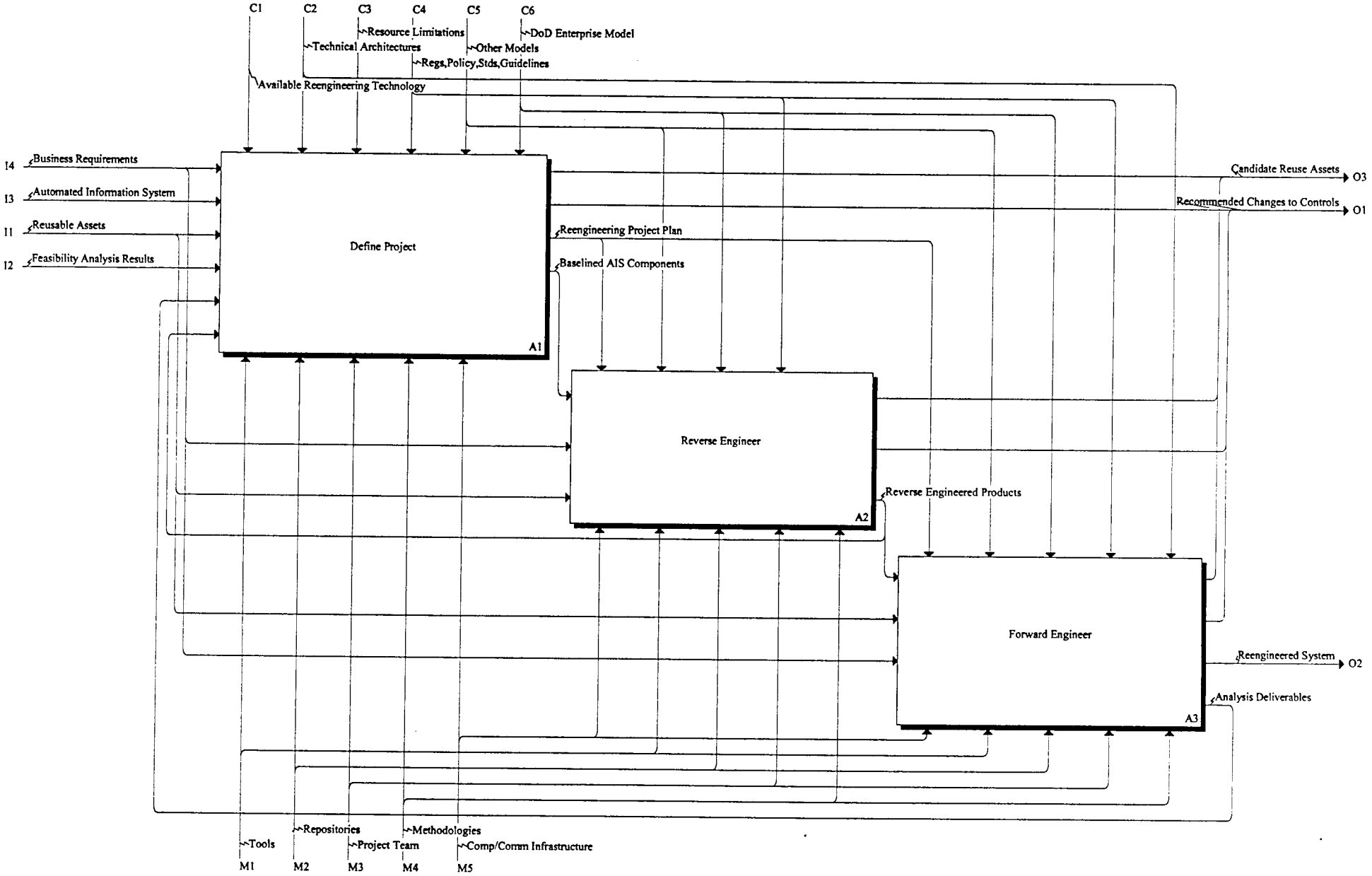

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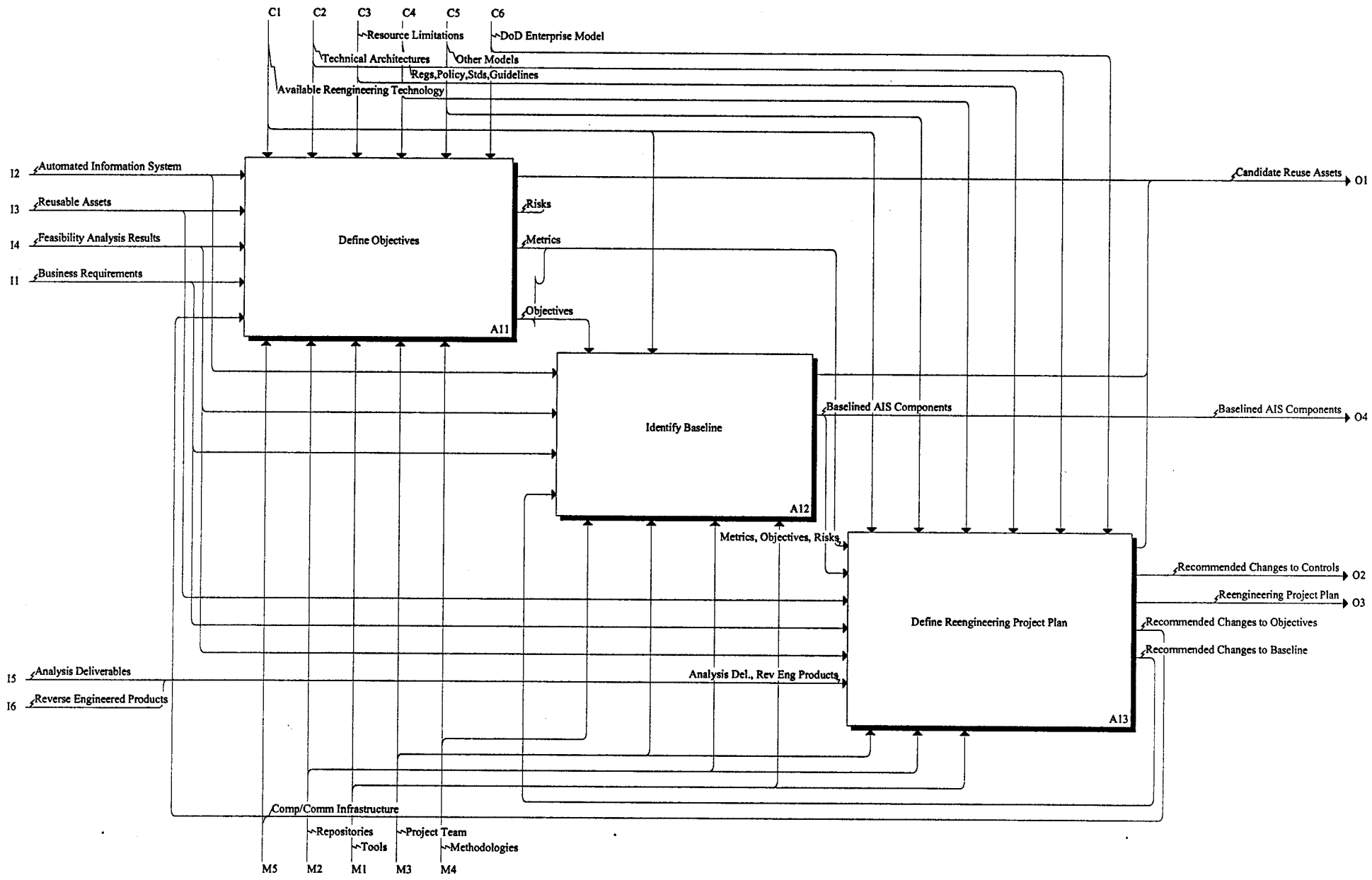

Node: A1 / C11	Title: Define Project	Number: Pg 5

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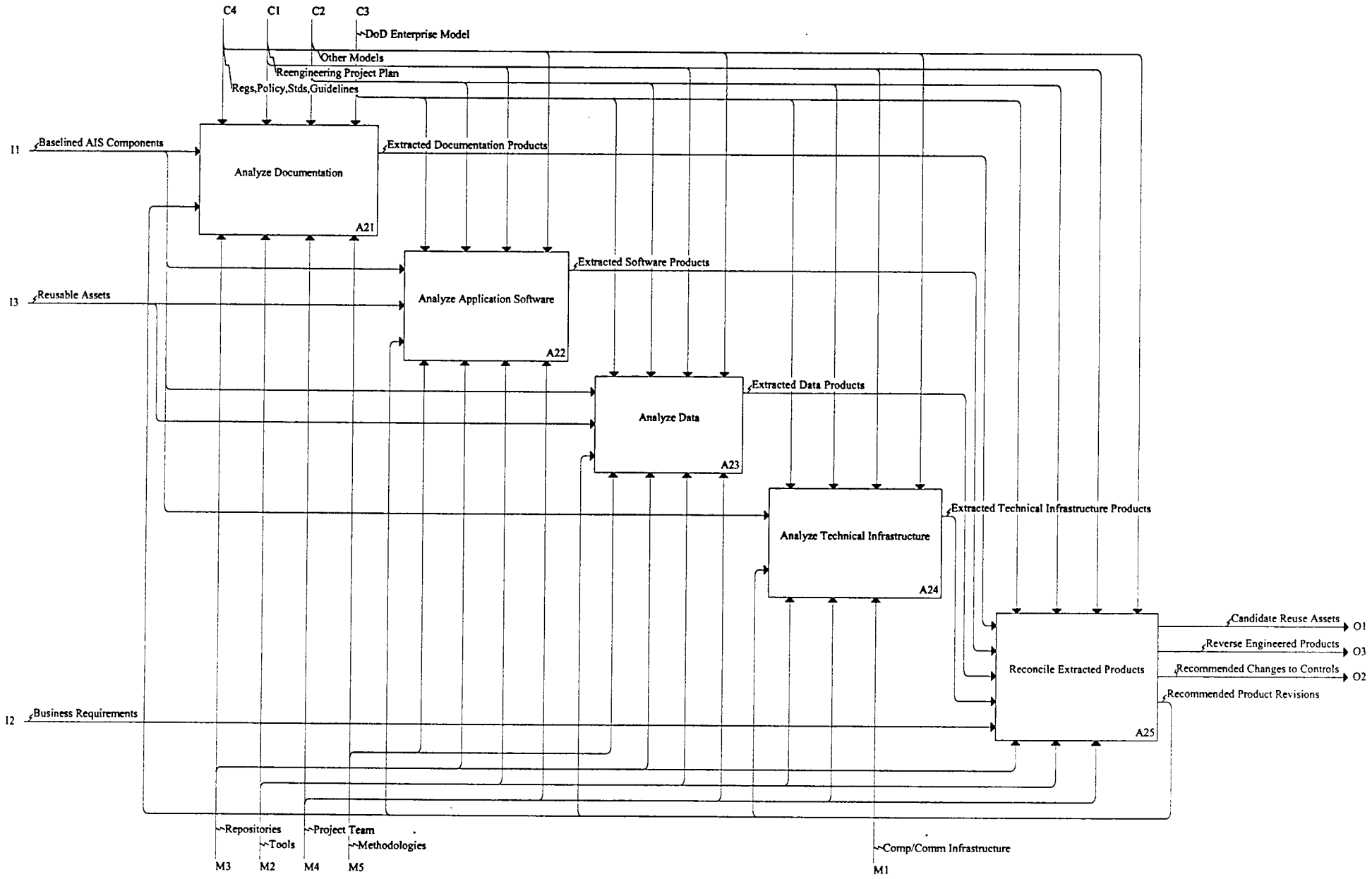

Node: A2 / C12	Title: Reverse Engineer	Number: Pg 6

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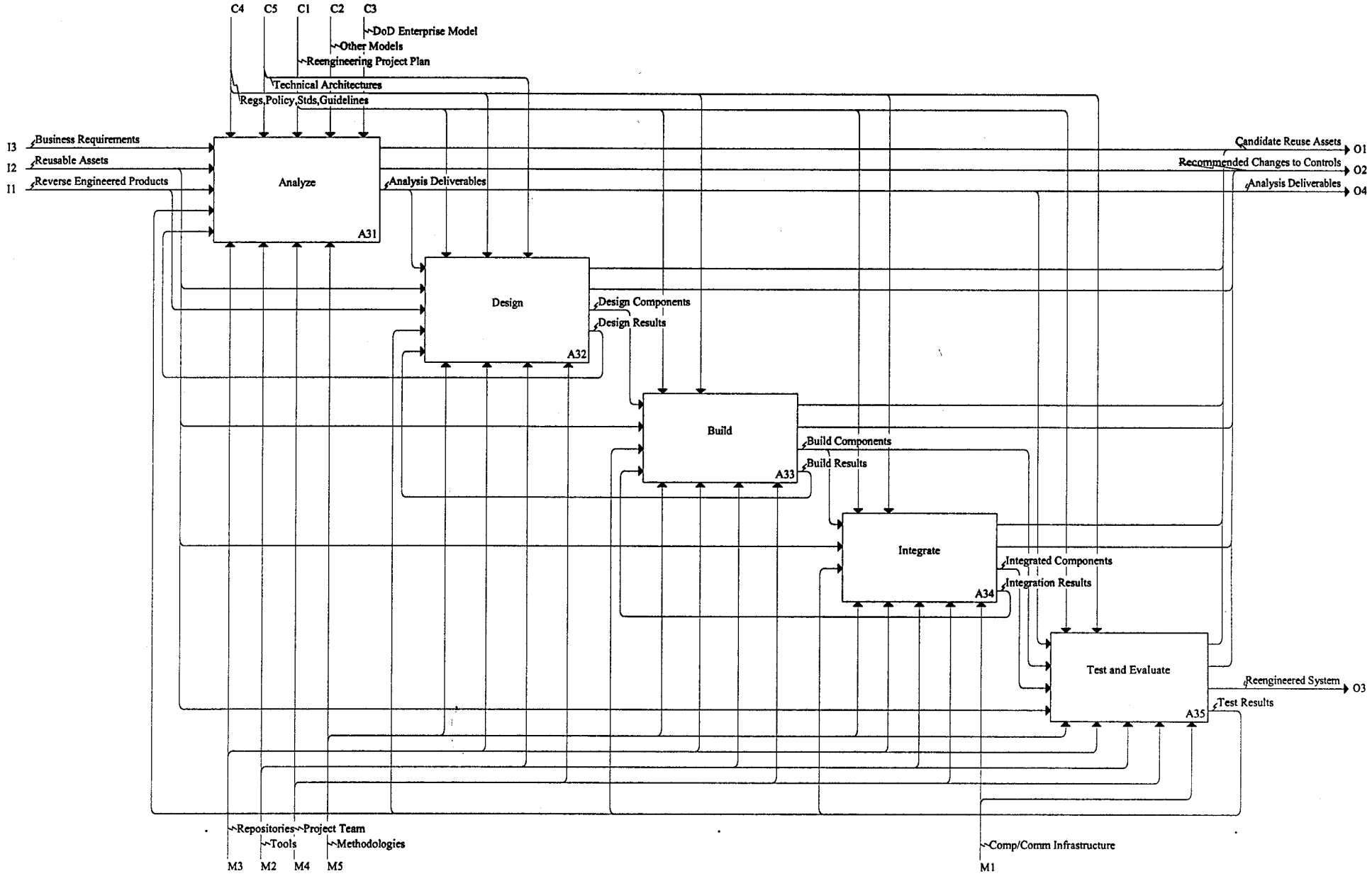

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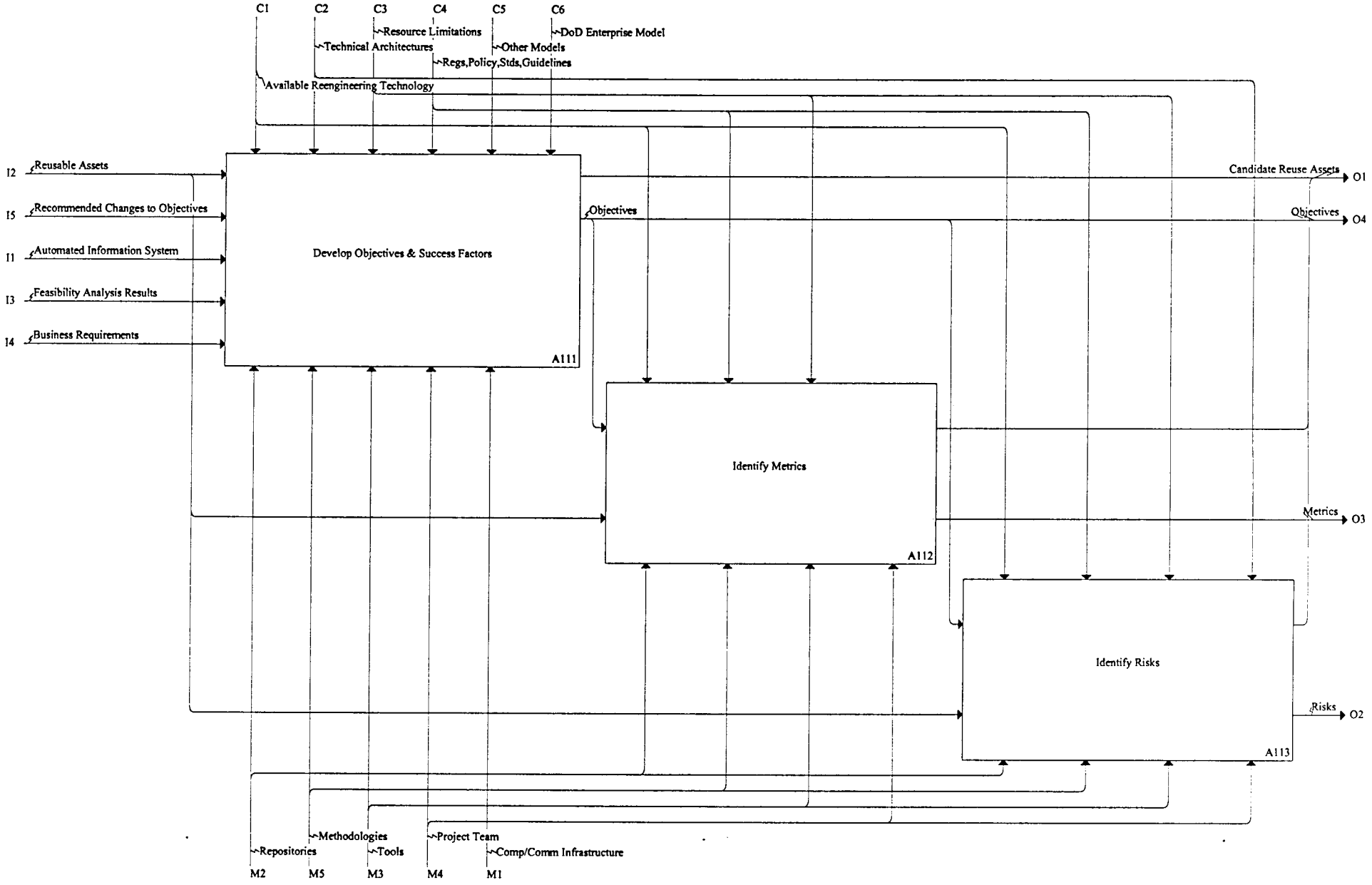

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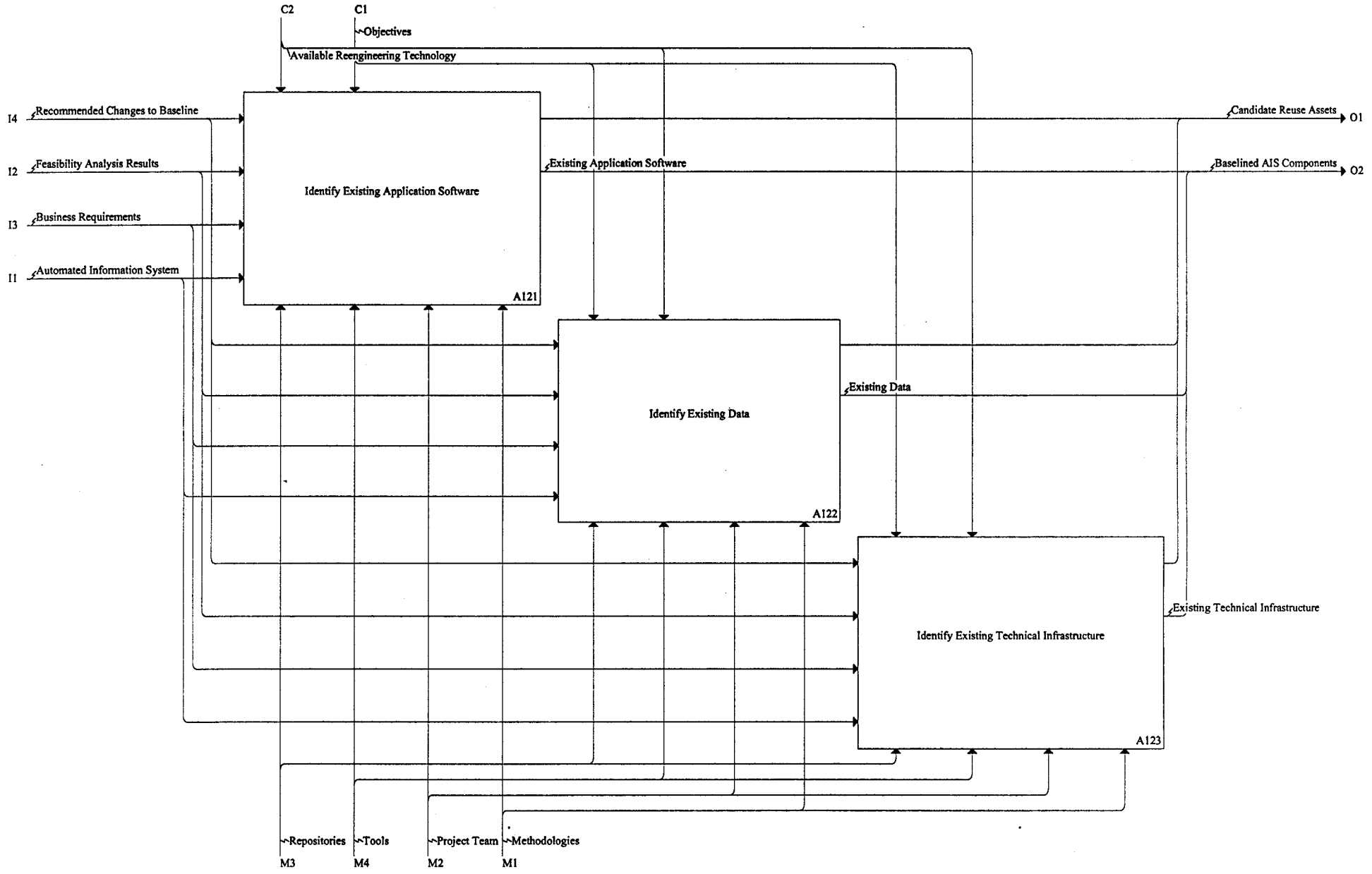

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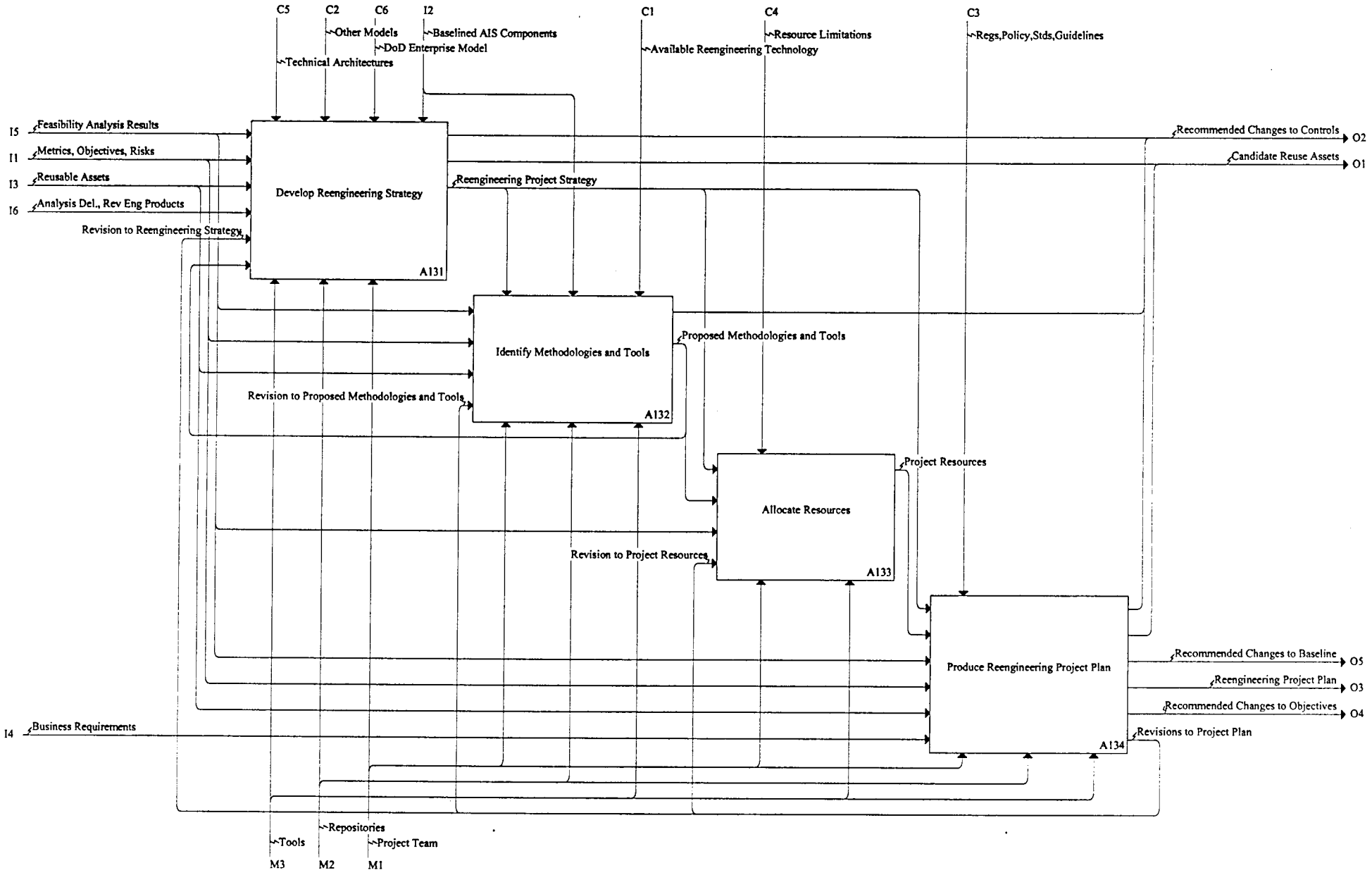

Node: A13 / C15	Title: Define Reengineering Project Plan	Number: Pg 10

4. GLOSSARY OF THE MODEL

The following is an alphabetic listing of the definitions for all the activities and their inputs, outputs, controls, and mechanisms in the Model. Definitions for all activities are presented first in the "Activity Pool." The "Concept Pool" follows containing the definitions for all inputs, controls, outputs, and mechanisms. Each definition contains a "Usage" section. The Usage for activities identifies the diagram where the activity appears and its node number. For example the activity called "Reengineer System" appears in Diagram C1 as Activity A0. The Usage for each concept states whether the concept is an input, control, output, or mechanism. For each usage of each concept, the node number and name of the related activity and the diagram is identified. For example, "Automated Information System" is an Input on Activity A0 (Reengineer System) in Diagram C1.

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Activity Pool

Allocate Resources

Define the resources for performing the reengineering project, including allocation of funds, personnel, tools, and computer resources. Available funding and computer resource support for methodologies and tools are determined. Necessary training for personnel on computer resources, methodologies, and tools is also determined.

Usage

Appears in Diagram C15 as A133

Analyze

The Business Requirements and the Reverse Engineered Products are analyzed during this activity to generate the Analysis Deliverables. Reengineering Project Plan and Regulations, Policy, Standards, and Guidelines analysis define this activity, including the Analysis Deliverables. The Analysis Deliverables include requirements for Testing and a formal specification of the analyzed Business Requirements which are not addressed in the Reverse Engineered Products and must be forward engineered.

Usage

Appears in Diagram C13 as A31

Analyze Application Software

This activity analyzes the existing application software to extract software products, including but not limited to process models and the information needed to define the business rules, design model, system specification, functional requirements, data models, and design decisions. The activity also includes collecting metric data.

Usage

Appears in Diagram C12 as A22

Analyze Data

This activity analyzes the existing data to extract data products, including but not limited to data models and the information needed to define the business rules, design model, system specification, functional requirements, process models and design decisions. The activity also includes collecting metric data.

Usage

Appears in Diagram C12 as A23

Analyze Documentation

This activity analyzes the existing documentation to extract documentation products, including but not limited to information needed to define the business rules, design model, system specification, technical infrastructure capabilities, data models, process models, and design decisions. The activity also includes collecting metric data.

Usage

Appears in Diagram C12 as A21

Analyze Technical Infrastructure

This activity analyzes the existing technical infrastructure to extract technical infrastructure products including, but not limited to the technical infrastructure and the information needed to collect metric data and define design decisions.

Usage

Appears in Diagram C12 as A24

Build

The Design Components are used to generate the Build Components. Reusable Assets are employed as possible. The Test Results verify whether the Build Components conform to specification. The Reengineering Project Plan and Regulations, Policy, Standards, and Guidelines concerning build procedures define this activity, the structure for the Build Components and the expected Build Results.

Usage

Appears in Diagram C13 as A33

Define Objectives

The objectives of the reengineering effort are identified by the organizational goals of the reengineering effort, including objectives for using the system, supporting the system, and the objectives of utilizing reengineering technology. The Project Team identifies the objectives and interviews those individuals whose objectives are to be included as part of the reengineering effort. This activity defines the target environment (software and hardware) and the intended maintenance and operational plans.

Development of concrete measurable objectives is an essential step in establishing the foundation for developing a project strategy contained to guide the efforts of the reengineering effort. The expression of these goals should show how the business needs of the organization and new system requirements will be met, and how Regulations, Policy, Standards, and Guidelines, and the schedule will control the reengineering effort, and what is expected of the methodologies and tools that will be applied during the reengineering effort.

Define Objectives is composed of the activities: Develop Objectives and Success Factors, Identify Metrics, and Identify Risks.

Usage

Appears in Diagram C11 as A11

Define Project

The Project Team defines the Reengineering Project Plan during the Define Project activity by examining the organization's Business Requirements, the existing Automated Information System and Available Reengineering Technology. Any Feasibility Analysis Results that are available should be examined for information useful in defining this plan.

The business requirements which can be reverse engineered and those which must be implemented during the Forward Engineer activity are identified and reconciled during the Define Project activity. The identity of those requirements addressed in the existing AIS may not be available until the AIS is reverse engineered. Reverse Engineered Products are used to update and revise the Reengineering Project Plan accordingly. Analysis Deliverables supply information about the Business Requirements to be implemented during Forward Engineering and are used to update and revise the Reengineering Project Plan.

The Define Project activity also identifies critical success factors which will indicate whether the reengineering effort was successful. The Project Team should employ Methodologies and Tools for planning the project, including project and configuration management tools. Repositories are used to retrieve information about Available Reengineering Technology and the Automated Information System. Define Project is composed of the activities: Define Objectives, Identify Baseline, and Define Reengineering Project Plan.

Usage

Appears in Diagram C10 as A1

Define Reengineering Project Plan

Define a structured plan for accomplishing the reengineering. This plan will dictate how Regulations, Policy, Standards, and Guidelines will be followed. This activity is composed of the activities called Develop Reengineering Strategy, Identify Tools and Methodologies, Allocate Resources, and Produce Reengineering Project Plan for implementing the reengineering. The Reengineering Project Plan contains the information in the products of these activities.

Usage

Appears in Diagram C11 as A13

Design

The Analysis Deliverables and the Reverse Engineered Products concerning Design are used to generate the Design Components during this activity. The Reengineering Project Plan and Regulations, Policy, Standards, and Guidelines concerning Design define this activity, the structure for the Design Components and the expected Design Results.

Usage

Appears in Diagram C13 as A32

Develop Objectives & Success Factors

This activity identifies the Objectives of the reengineering project links these Objectives to Critical Success Factors to prove the success of the reengineering project. These Objectives must also be mapped to Metrics and their associated Risks.

Usage

Appears in Diagram C17 as A111

Develop or Reengineer Systems

Functional (Business) Requirements and Technical Requirements are used to either develop new systems or utilize existing AISs to reengineer systems. These activities follow the processes specified in eixsting military or commercial standards. AISs are developed and reengineered under configuration management.

Usage

Appears in Diagram C18 as A3

Develop Reengineering Strategy

The Project Strategy identifies reengineering alternatives which include scenarios, possible incorporation of new technology and approaches, and the use of methodologies and tools. Possible scenarios include, but are not limited to restructuring, redocumentation, and data rationalization. The alternatives are evaluated with respect to objectives and risks. A strategy for reengineering is selected from the possible alternatives.

The reengineering strategy should address the development of a reengineering testing strategy and an acceptance testing strategy. Certification procedures are part of the acceptance testing strategy. A portfolio analysis may be performed. The Project Strategy drives the selection of methodologies and tools, requiring these to adequately support the Project Strategy through Revisions to Proposed Methodologies and Tools.

Usage

Appears in Diagram C15 as A131

Figure 1. Context for Information Management

Usage

Appears in Model C16 (Figure 1. Context for Information Management) as A0

Forward Engineer

Within the context of reengineering, forward engineering is the software engineering activities that consume the products of reverse engineering and reuse activities, and new system requirements to produce a target system [CIM93a]. The Project Team performs traditional life-cycle development that is moving from high-level abstractions and logical implementation-independent design to the physical implementation of the system. DoD Enterprise Model and Other Models are employed. Regulations, Policy, Standards, and Guidelines concerning application software are complied and the schedule adhered.

All of the components should be implemented during forward engineering as Candidate Reusable Assets. Appropriate standards, including DOD-STD-2167A, the draft DOD-STD-498 and subsequent standards which should be followed when producing the applicable documents.

Forward Engineering is composed of the activities called Analyze, Design, Build, Integrate, and Test & Evaluate.

Usage

Appears in Diagram C10 as A3

Identify Baseline

The Project Team will identify the configuration items which comprise the current automated information system. This activity does not analyze these configuration items, but simply identifies the system upon which the reengineering activities will be performed. These items include, but are not limited to the technical infrastructure, data, application software, and all associated documentation. Methodologies and Tools are available which assist in identifying these configuration items.

Objectives may control the activity of Identify Baseline by impacting the identification of the Baselined AIS Components. Examples of such Objectives include the objective to reengineer a previous identification version or the objective to reconcile several versions of the same system.

Usage

Appears in Diagram C11 as A12

Identify Existing Application Software

Identify the application software and associated documentation for this information system. This software does not include Commercial-Off-the-Shelf (COTS) software.

Usage

Appears in Diagram C14 as A121

Identify Existing Data

Identify the existing data configuration items and associated documentation for this information system.

Usage

Appears in Diagram C14 as A122

Identify Existing Technical Infrastructure

Identify the technical infrastructure and associated documentation for this information system.

Usage

Appears in Diagram C14 as A123

Identify Methodologies and Tools

Proposed Methodologies and Tools are identified by an analysis of Available Reengineering Technology. The Proposed Methodologies and Tools must integrate into the sponsoring organizations current software engineering environment and support the automation of activities defined by the Project Strategy. The Define Project Strategy may require Revisions in Selected Methodologies and Tools to adequately support the Project Strategy. The Allocate Resources activity may require Revisions in Selected Methodologies and Tools to insure these adhere to Project Resources. The Generate Reengineering Project Plan may also require Revisions in Selected Methodologies and Tools to insure overall compliance with the controls and Business Requirements.

Usage

Appears in Diagram C15 as A132

Identify Metrics

This activity uses the Objectives of the reengineering project to identify a set of metrics which can be used to determine if the Objectives are being met throughout the project's duration.

Usage

Appears in Diagram C17 as A112

Identify Risks

This activity identifies the potential risks associated with the Objectives. By identifying these risks, steps can be taken to help mitigate the impact should they occur. The potential impact on the reengineering project if these risks occur should be identified and a risk management plan outlined.

Usage

Appears in Diagram C17 as A113

Implement, Operate & Maintain

The system is implemented, operated, and maintained under configuration management. During this time operational experience is cummulated and used to assess and improve the direction of guidance for DoD.

Usage

Appears in Diagram C18 as A5

Integrate

Any number of Build Components are integrated to form Integrated Components. This activity insures the interfaces between Build Components are complete. Regulations, Policy, Standards, and Guidelines concerning integration procedures and the Reengineering Project Plan define this activity, including the structure for the Integrated Components and the expected Integration Results.

Usage

Appears in Diagram C13 as A34

Perform Functional Process Improvement

(FPI) guides managers to identify the current business needs and implement business process improvements. Reverse Engineered Products are used to obtain an accurate description of the current AIS environment. The functional requirements are forward engineered into new or reengineered systems according to appropriate standards.

FPI enables managers to identify current problems, including poor business practices, establish costs for activities, propose changes and implement business improvements. Technical Improvement Opportunities result from technology changes identified in the Perform Technical & Economic Analysis activity.

Usage

Appears in Diagram C18 as A1

Perform Information Management

Usage

None

Perform Technical & Economic Analysis

Technical & Economic Analysis is performed to determine the technical and economic feasibility of using AISs to support the business processes. Reverse Engineered Products providing a description of the current AIS environment and Operational Experience are compared to the Functional (Business) Requirements and available technology to produce recommendations on the use of technology in the Technical Improvement Opportunities.

Usage

Appears in Diagram C18 as A2

Produce Reengineering Project Plan

The Project Plan is developed by reconciling the Project Resources, Project Strategy, and Project Methodologies and Tools. The Plan must adhere to applicable Regulations, Policy, Standards, and Guidelines. The Plan is validated against the Objectives for the Project. Recommended changes to the Other Models, Technical Architectures, and Objectives may be generated. A procedure for tracing the products of the reengineering effort to the Objectives and Business Requirements are outlined.

Usage

Appears in Diagram C15 as A134

Reconcile Extracted Products

This activity integrates the information contained in the Extracted Documentation Products, Extracted Software Products, Extracted Data Products, and the Extracted Technical Infrastructure Products to form the Reverse Engineered Products. The Reverse Engineered Products may include, but are not limited to the business rules, design models, system specifications, functional requirements, metric data, data models, process models, and design decisions.

Usage

Appears in Diagram C12 as A25

Redocumentation

Redocumentation produces supplementary information that provides understanding of the existing system and its components [CIM93a]. This activity does not alter the existing system implementation. Redocumentation is often performed during Reverse Engineer activity to produce interim documentation that is used to generate or is converted to the Reverse Engineered Products.

Usage

None

Reengineer System

Reengineering describes the activities supporting the development and migration of automated information systems based on the examination and alteration of existing software systems.

The Business Requirements are those requirements which are proposed for implementation in the Reengineered System. Some of these requirements may be implemented in the existing automated information system, while others may have to be implemented during the forward engineering process. Feasibility Analysis Results may be available to provide information to support the comprehensive reengineering project. Reusable Assets should be explored for use throughout the reengineering effort.

The DoD Enterprise Model provides the high-level vision for the Reengineered System, while Other Models govern the domain in which this system will operate. Regulations, Policy, Standards, and Guidelines govern the activities and products to be produced during the reengineering. Resource Limitations provide the scope in which the reengineering effort is supported. Technical Architectures provide an infrastructure in which the Reengineered System must execute. Available Reengineering Technology is examined for its applicability in this specific project.

The reengineering effort often produces a complete Reengineered System, as well as Candidate Reuse Assets which may support other development and migration efforts. As experience in reengineering increases, Recommended Changes to Controls governing these activities will help improve the processes.

Software Engineering Environment which supports software reengineering is composed of a Project Team, Methodologies, Tools, Repositories, and a Computing/Communications Infrastructure.

The selection of the members of the Project Team is key to a successful project. Matching skills with the activities described in this model insures productivity and minimizes risk. The activities described in this model support an overall migration plan. The selection of automated information systems for reengineering supports successful process improvement. The selection of team members, migration plan development, and candidate selection are not addressed in this model, but support the overall reengineering process.

The Reengineer System activity is composed of three activities: Define Project, Reverse Engineer, and Forward Engineer.

Usage

Appears in Model C1 as A0

Restructuring

The transformation from one representation form to another while preserving the external behavior, both functionally and semantically [ChCr90]. Restructuring is performed to improve the existing structure without altering the functionality. Restucturing is often used to improve maintainability.

Usage

None

Reverse Engineer

The Project Team examines the Baselined AIS Components by analyzing the documentation, application software, data structures and the technical infrastructure within which the information system operates. This analysis is performed to identify the system components and their interrelationships, and to create representations of the system in another form or at a higher abstraction level to provide a better understanding of the system as defined by reverse engineering [ChCr90, CIM93a].

Reusable Assets should be used to compose these representations. Reverse Engineering Tools are used in this process to produce manageable and usable Reverse Engineered Products which become the foundation or framework to Forward Engineer. These generated representations should be developed for reuse. These are submitted to a reuse certification program as Candidate Reuse Assets.

Reverse Engineer is composed of the activities called: Analyze Documentation, Analyze Data, Analyze Application Software, Analyze Technical Infrastructure, and Reconcile Extracted Products.

Usage

Appears in Diagram C10 as A2

Test and Evaluate

The Integrated Components are tested using a testing plan developed from the requirements defined in the Analysis Deliverables. Individual Build Components are also tested according to the individual component specifications. The Reengineering Project Plan and the Regulations, Policy, Standards, and Guidelines concerning test procedures define this activity and the expected Test Results. The Test Results will be evaluated in accordance with certification procedures identified in the Reengineering Project Plan.

Usage

Appears in Diagram C13 as A35

Transition to Operation & Maintenance

The New or Reengineered System and Operational Experience are studied to produce a Transition Plan and Training necessary to put the system into operation and subsequent maintenance.

Usage

Appears in Diagram C18 as A4

Concept Pool

AIS

See Automated Information System.

Usage

None

Analysis Del., Rev Eng Products

See Analysis Deliverables and Reverse Engineered Products.

Usage

tunneled into C11
Input on Activity A13 (Define Reengineering Project Plan) in C11
Appears in C11 in Breakdown Analysis Del., Rev :: Reverse Engineere, Analysis Delivera
Input on Activity A13 (Define Reengineering Project Plan) in C15
Input on Activity A131 (Develop Reengineering Strategy) in C15

Analysis Deliverables

Required documentation summarizing the results of the analysis phase. Refer to DOD-STD-2167A, the proposed DOD-STD-498 and subsequent standards for guidelines on producing these documents.

The Analysis Deliverables include refined feasibility analysis results, an updated risk analysis, and the requirements for testing the reengineered system and its components. These requirements are sent to the Test & Evaluate activity in forward engineering.

The Analysis Deliverables also provide information which impacts the Reengineering Project Plan. This information is provided to the Define Project activity for updating the Plan.

Usage

Output on Activity A3 (Forward Engineer) in C10
Input on Activity A1 (Define Project) in C10
Input on Activity A1 (Define Project) in C11
tunneled into C11
Appears in C11 in Breakdown Analysis Del., Rev :: Reverse Engineere, Analysis Delivera
Output on Activity A31 (Analyze) in C13
Output on Activity A3 (Forward Engineer) in C13
Input on Activity A32 (Design) in C13
Input on Activity A35 (Test and Evaluate) in C13

Automated Information System

(AIS) Consists of any combination of computer hardware, computer software, telecommunications, information technology, personnel, data, documentation and other resources which collect, record, process, store, communicate, retrieve, and display information. [DoD92d] More than one system or parts of different systems may be input to the software reengineering activity. "An AIS can include computer software only, computer hardware only, or any combination of the above" [DoD92d].

Usage

tunneled into C1
Input on Activity A0 (Reengineer System) in C1
Input on Activity A0 (Reengineer System) in C10
Input on Activity A1 (Define Project) in C10
Input on Activity A1 (Define Project) in C11
Input on Activity A11 (Define Objectives) in C11
Input on Activity A12 (Identify Baseline) in C11
Input on Activity A12 (Identify Baseline) in C14
Input on Activity A121 (Identify Existing Application Software) in C14
Input on Activity A122 (Identify Existing Data) in C14
Input on Activity A123 (Identify Existing Technical Infrastructure) in C14
Input on Activity A11 (Define Objectives) in C17
Input on Activity A111 (Develop Objectives & Success Factors) in C17

Available Reengineering Technology

Available Reengineering Technology identifies proposed methodologies and tools available for automating software reengineering. The Available Reengineering Technology constrains the Reengineering Project Plan, by impacting the Methodologies and Tools available for automating the software reengineering effort. It also impacts the schedule and funding by the training necessary to use this technology and the productivity improvements in automating the software reengineering process. Repositories may exist that provide information on Available Reengineering Technology.

Usage

tunneled into C1
Control on Activity A0 (Reengineer System) in C1
Control on Activity A0 (Reengineer System) in C10
Control on Activity A1 (Define Project) in C10
Control on Activity A1 (Define Project) in C11
Control on Activity A11 (Define Objectives) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C11
Control on Activity A12 (Identify Baseline) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C15
Control on Activity A132 (Identify Methodologies and Tools) in C15

Control on Activity A12 (Identify Baseline) in C14
Control on Activity A122 (Identify Existing Data) in C14
Control on Activity A121 (Identify Existing Application Software) in C14
Control on Activity A123 (Identify Existing Technical Infrastructure) in C14
Control on Activity A11 (Define Objectives) in C17
Control on Activity A111 (Develop Objectives & Success Factors) in C17
Control on Activity A112 (Identify Metrics) in C17
Control on Activity A113 (Identify Risks) in C17

Baselined AIS Components

The selected information system components comprised of the technical infrastructure, data, application software, and all associated documentation which will be used during reverse engineering.

Usage

Output on Activity A1 (Define Project) in C10
Input on Activity A2 (Reverse Engineer) in C10
Output on Activity A12 (Identify Baseline) in C11
Output on Activity A1 (Define Project) in C11
Input on Activity A13 (Define Reengineering Project Plan) in C11
Input on Activity A2 (Reverse Engineer) in C12
Input on Activity A21 (Analyze Documentation) in C12
Input on Activity A22 (Analyze Application Software) in C12
Input on Activity A23 (Analyze Data) in C12
Input on Activity A24 (Analyze Technical Infrastructure) in C12
tunneled into C14
Output on Activity A12 (Identify Baseline) in C14
Appears in C14 in Breakdown Baselined AIS Compo:: Existing Technica, Existing Applicat, Existing Data
Input on Activity A13 (Define Reengineering Project Plan) in C15
Control on Activity A131 (Develop Reengineering Strategy) in C15
Control on Activity A132 (Identify Methodologies and Tools) in C15

Build Components

Constructed system parts to be interfaced during the Integrate activity, including the required documentation summarizing the results of the coding phase. Refer to DOD-STD-2167A, the proposed DOD-STD-498 and subsequent standards for guidelines on producing these documents.

Usage

Output on Activity A33 (Build) in C13
Input on Activity A34 (Integrate) in C13
Input on Activity A35 (Test and Evaluate) in C13

Build Results

A description of the results of the Build activity either confirming that the Build Components have been constructed or a request for clarification on a design issue that is preventing the completion of the Build activity.

Usage

Output on Activity A33 (Build) in C13
Input on Activity A32 (Design) in C13

Business Requirements

Organizational goals and the user identified needs for the reengineered software system. Some of these requirements may be met in existing AIS, while others may have to be implemented as part of the new system.

Usage

tunneled into C1
Input on Activity A0 (Reengineer System) in C1
Input on Activity A0 (Reengineer System) in C10
Input on Activity A1 (Define Project) in C10
Input on Activity A2 (Reverse Engineer) in C10
Input on Activity A3 (Forward Engineer) in C10
Input on Activity A1 (Define Project) in C11
Input on Activity A11 (Define Objectives) in C11
Input on Activity A12 (Identify Baseline) in C11
Input on Activity A13 (Define Reengineering Project Plan) in C11
Input on Activity A2 (Reverse Engineer) in C12
Input on Activity A25 (Reconcile Extracted Products) in C12
Input on Activity A3 (Forward Engineer) in C13
Input on Activity A31 (Analyze) in C13
Input on Activity A12 (Identify Baseline) in C14
Input on Activity A121 (Identify Existing Application Software) in C14
Input on Activity A122 (Identify Existing Data) in C14
Input on Activity A123 (Identify Existing Technical Infrastructure) in C14
Input on Activity A13 (Define Reengineering Project Plan) in C15
Input on Activity A134 (Produce Reengineering Project Plan) in C15
Input on Activity A11 (Define Objectives) in C17
Input on Activity A111 (Develop Objectives & Success Factors) in C17

Candidate Reuse Assets

Candidate Reuse Assets are potential reusable assets identified during the reengineering effort. Like Reusable Assets, the Candidate Reuse Assets are software work products, including source code, documentation, designs, test data, tools, lessons, learned, and specifications. These candidates are input to a reuse certification program for verification and validation as to potential usability in multiple software systems.

Candidate Reuse Assets may describe repeatable processes such as reengineering strategies, maintenance processes, or new business practices.

Usage

Output on Activity A0 (Reengineer System) in C1
tunneled into C1
Output on Activity A2 (Reverse Engineer) in C10
Output on Activity A3 (Forward Engineer) in C10
Output on Activity A1 (Define Project) in C10
Output on Activity A0 (Reengineer System) in C10
Output on Activity A25 (Reconcile Extracted Products) in C12
Output on Activity A2 (Reverse Engineer) in C12
Output on Activity A31 (Analyze) in C13
Output on Activity A32 (Design) in C13
Output on Activity A33 (Build) in C13
Output on Activity A34 (Integrate) in C13
Output on Activity A35 (Test and Evaluate) in C13
Output on Activity A3 (Forward Engineer) in C13
Output on Activity A11 (Define Objectives) in C11
Output on Activity A12 (Identify Baseline) in C11
Output on Activity A13 (Define Reengineering Project Plan) in C11
Output on Activity A1 (Define Project) in C11
Output on Activity A121 (Identify Existing Application Software) in C14
Output on Activity A122 (Identify Existing Data) in C14
Output on Activity A123 (Identify Existing Technical Infrastructure) in C14
Output on Activity A12 (Identify Baseline) in C14
Output on Activity A131 (Develop Reengineering Strategy) in C15
Output on Activity A134 (Produce Reengineering Project Plan) in C15
Output on Activity A13 (Define Reengineering Project Plan) in C15
Output on Activity A111 (Develop Objectives & Success Factors) in C17
Output on Activity A112 (Identify Metrics) in C17
Output on Activity A113 (Identify Risks) in C17
Output on Activity A11 (Define Objectives) in C17

Comp/Comm Infrastructure

A service utility that provides common shared computing and communications capabilities, including data base, common networks, electronic messaging, and computing platforms.

Usage

tunneled into C1
Mechanism on Activity A0 (Reengineer System) in C1
Mechanism on Activity A0 (Reengineer System) in C10
Mechanism on Activity A1 (Define Project) in C10
Mechanism on Activity A3 (Forward Engineer) in C10
Mechanism on Activity A2 (Reverse Engineer) in C10
Mechanism on Activity A1 (Define Project) in C11
Mechanism on Activity A11 (Define Objectives) in C11
Mechanism on Activity A3 (Forward Engineer) in C13
Mechanism on Activity A34 (Integrate) in C13
Mechanism on Activity A35 (Test and Evaluate) in C13
Mechanism on Activity A2 (Reverse Engineer) in C12
Mechanism on Activity A24 (Analyze Technical Infrastructure) in C12
Mechanism on Activity A11 (Define Objectives) in C17
Mechanism on Activity A111 (Develop Objectives & Success Factors) in C17

Computing/Communications Infrastructure

See Comp/Comm Infrastructure.

Usage

None

Data

Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans through automatic means [DoD92b].

Usage

None

Data Model

A graphical and textual representation of analysis that identifies the data needed by an organization to achieve its mission, functions, goals, objectives, and strategies and to manage and operate the organization. It identifies the data, their attributes, and relationships or associations with other data. Data Models include the logical, physical, and/or normalized models.

Ref.: DoD Technical Architecture Framework for Information Management (Architecture Guidance and Design Concepts), Version 1.1, Vol.2, Center for Information Management, Arlington VA, 22204-2199, October 1992.

Usage

None

Design Components

Modules representing a design of the system parts to be constructed during the Build activity, including the required documentation summarizing the results of the design phase. Refer to DOD-STD-2167A, the proposed DOD-STD-498 and subsequent standards for guidelines on producing these documents.

Usage

Output on Activity A32 (Design) in C13
Input on Activity A33 (Build) in C13

Design Results

A description of the results of the Design activity either confirming that the Design Components have been constructed or a request for clarification of a analysis issue that is preventing the completion of the Design activity.

Usage

Output on Activity A32 (Design) in C13
Input on Activity A31 (Analyze) in C13

DoD Enterprise Model

The DoD Enterprise Model is a representation of the activities and data of the Department of Defense (DoD) needed to accomplish the defense mission, from warfighting to acquisition and logistics support. This Model is the basis for defining, coordinating and integrating DoD missions and functions. It enables leaders and managers to better understand and direct their areas of responsibility, and to integrate functional process improvement initiatives within and across functional and organizational boundaries.

Ref.: The DoD Enterprise Model, February 1994, OASD(C3I), 1225 Jefferson Davis Highway, Suite 910, Arlington, VA 22202-4301.

Usage

tunneled into C1
Control on Activity A0 (Reengineer System) in C1
Control on Activity A0 (Reengineer System) in C10
Control on Activity A1 (Define Project) in C10
Control on Activity A2 (Reverse Engineer) in C10
Control on Activity A3 (Forward Engineer) in C10
Control on Activity A1 (Define Project) in C11
Control on Activity A11 (Define Objectives) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C11
Control on Activity A2 (Reverse Engineer) in C12
Control on Activity A21 (Analyze Documentation) in C12
Control on Activity A22 (Analyze Application Software) in C12
Control on Activity A23 (Analyze Data) in C12
Control on Activity A24 (Analyze Technical Infrastructure) in C12
Control on Activity A25 (Reconcile Extracted Products) in C12
Control on Activity A3 (Forward Engineer) in C13
Control on Activity A31 (Analyze) in C13
Control on Activity A13 (Define Reengineering Project Plan) in C15
Control on Activity A131 (Develop Reengineering Strategy) in C15
Control on Activity A11 (Define Objectives) in C17
Control on Activity A111 (Develop Objectives & Success Factors) in C17

Existing Application Software

Description of the application software within the AIS and all associated documentation. This software was developed specifically for the existing automated information system and does not include any commercially produced software.

Usage

Output on Activity A121 (Identify Existing Application Software) in C14
tunneled into C14
Appears in C14 in Breakdown Baselined AIS Compo:: Existing Technica, Existing Applicat, Existing Data

Existing Data

Description of the data utilized within the AIS, including the data elements, their implemented data structure, and all associated documentation.

Usage

Output on Activity A122 (Identify Existing Data) in C14
tunneled into C14
Appears in C14 in Breakdown Baselined AIS Compo:: Existing Technica, Existing Applicat, Existing Data

Existing Technical Infrastructure

Description of the technical infrastructure portion of the AIS. This infrastructure may include, but is not limited to the information describing the capabilities and the structure of the hardware, operating system, integrated Commercial-Off-the-Shelf (COTS), Government-Off-the-Shelf (GOTS) products, and non-developmental software.

Usage

Output on Activity A123 (Identify Existing Technical Infrastructure) in C14
tunneled into C14
Appears in C14 in Breakdown Baselined AIS Compo:: Existing Technica, Existing Applicat, Existing Data

Extracted Data Products

These products may include, but are not limited to data models and the information needed to define business rules, design models, system specifications, functional requirements, process models, and design decisions, and collect metric data.

Usage

Output on Activity A23 (Analyze Data) in C12
Input on Activity A25 (Reconcile Extracted Products) in C12

Extracted Documentation Products

These products may include, but are not limited to the information needed to define business rules, design models, system specifications, technical infrastructure capabilities, data models, process models, and design decisions.

Usage

Output on Activity A21 (Analyze Documentation) in C12
Input on Activity A25 (Reconcile Extracted Products) in C12

Extracted Software Products

These products may include, but are not limited to process models and the information needed to define business rules, design models, system specifications, functional requirements, data models, and design decisions, and collect metric data.

Usage

Output on Activity A22 (Analyze Application Software) in C12
Input on Activity A25 (Reconcile Extracted Products) in C12

Extracted Technical Infrastructure Products

These products may include, but are not limited to a description of the technical infrastructure capabilities and the information needed to collect metric data and define design decisions.

Usage

Output on Activity A24 (Analyze Technical Infrastructure) in C12
Input on Activity A25 (Reconcile Extracted Products) in C12

Feasibility Analysis Results

The results from any study that may have been performed prior to the start of the reengineering project to scope the feasibility of reengineering should be used as input to the reengineering process. These results may identify and explore information necessary to perform the reengineering project. The results of this analysis should be input to the Software Reengineering Process Model and the members of the Reengineering Project Team should participate in the performance of this analysis.

These results may serve as controls on an activity, but may also serve as inputs which are consumed and altered by an activity, including new business requirements, critical success factors, and objectives. Therefore, the results from any feasibility analysis are represented as an input to the Reengineer System activity.

The results of the analysis may include, but are not limited to a cost/benefit analysis results, risk analysis and management, and a technical justification for the reengineering. The cost/benefit analysis determines the cost of performing the reengineering compared to the benefits expected from reengineering. The technical justification includes a description of how the reengineering project is justified based on the technical aspects of the effort.

Usage

tunneled into C1
Input on Activity A0 (Reengineer System) in C1
Input on Activity A0 (Reengineer System) in C10
Input on Activity A1 (Define Project) in C10
Input on Activity A1 (Define Project) in C11
Input on Activity A11 (Define Objectives) in C11
Input on Activity A12 (Identify Baseline) in C11
Input on Activity A13 (Define Reengineering Project Plan) in C11
Input on Activity A12 (Identify Baseline) in C14
Input on Activity A121 (Identify Existing Application Software) in C14
Input on Activity A122 (Identify Existing Data) in C14
Input on Activity A123 (Identify Existing Technical Infrastructure) in C14
Input on Activity A13 (Define Reengineering Project Plan) in C15
Input on Activity A131 (Develop Reengineering Strategy) in C15
Input on Activity A132 (Identify Methodologies and Tools) in C15
Input on Activity A133 (Allocate Resources) in C15
Input on Activity A134 (Produce Reengineering Project Plan) in C15
Input on Activity A11 (Define Objectives) in C17
Input on Activity A111 (Develop Objectives & Success Factors) in C17

Functional (Business) Requirements

Usage

Output on Activity A1 (Perform Functional Process Improvement) in C18
Input on Activity A2 (Perform Technical & Economic Analysis) in C18
Input on Activity A3 (Develop or Reengineer Systems) in C18

Information Management

(IM) Information Management is the creation, use, sharing, and disposition of information as a resource critical to the effective and efficient operation of functional activities. The structuring of functional processes to produce and control the use of data and information within functional activities, information systems, and Computing/Communications Infractructure. [DoD92d]

From a domain analysis perspective, IM would provide support toa domain which identifies commonalities accross applications of the specific business or technology area.

Information Management (IM) Services include such things as Tools, Methodologies, Repositories, and Computing/Communications Infrastructure.

Usage

None

Integrated Components

The interfaced Build Components representing part or all of the system to be tested during the Test & Evaluate activity. The Integrated Components include the required documentation summarizing the results of the Integrate phase.

Usage

Output on Activity A34 (Integrate) in C13
Input on Activity A35 (Test and Evaluate) in C13

Integration Results

A description of the results of the Integrate activity either confirming that the Build Components have been interfaced successfully or a request for clarification on an interface or build issue that is preventing the completion of the Integrate activity.

Usage

Output on Activity A34 (Integrate) in C13
Input on Activity A33 (Build) in C13

Methodologies

The systems of principles, procedures, and practices applied to the project definition, development, operation, reengineering and support of a software system. Reengineering methodologies are subdivided into project definition, reverse and forward engineering methodologies. These methodologies support various software engineering methodologies, which should be carefully investigated to ensure efficient technical integration into the sponsoring organization's existing software engineering environment.

Usage

tunneled into C1
Mechanism on Activity A0 (Reengineer System) in C1
Mechanism on Activity A0 (Reengineer System) in C10
Mechanism on Activity A1 (Define Project) in C10
Mechanism on Activity A2 (Reverse Engineer) in C10
Mechanism on Activity A3 (Forward Engineer) in C10
Mechanism on Activity A1 (Define Project) in C11
Mechanism on Activity A12 (Identify Baseline) in C11
Mechanism on Activity A11 (Define Objectives) in C11
Mechanism on Activity A2 (Reverse Engineer) in C12
Mechanism on Activity A21 (Analyze Documentation) in C12
Mechanism on Activity A22 (Analyze Application Software) in C12
Mechanism on Activity A23 (Analyze Data) in C12
Mechanism on Activity A3 (Forward Engineer) in C13
Mechanism on Activity A31 (Analyze) in C13
Mechanism on Activity A32 (Design) in C13
Mechanism on Activity A33 (Build) in C13
Mechanism on Activity A34 (Integrate) in C13
Mechanism on Activity A35 (Test and Evaluate) in C13
Mechanism on Activity A12 (Identify Baseline) in C14
Mechanism on Activity A121 (Identify Existing Application Software) in C14
Mechanism on Activity A122 (Identify Existing Data) in C14
Mechanism on Activity A123 (Identify Existing Technical Infrastructure) in C14
Mechanism on Activity A11 (Define Objectives) in C17
Mechanism on Activity A111 (Develop Objectives & Success Factors) in C17
Mechanism on Activity A112 (Identify Metrics) in C17
Mechanism on Activity A113 (Identify Risks) in C17

Metrics

Metrics are measurable implements which can be used to predict, monitor, and evaluate the success of the reengineering project. Metrics should be identified and linked to the Objectives and Critical Success Factors identified for each individual reengineering project. The Goal/Question/Metrics technique is often used to assist in identifying Metrics and linking the Metrics to Objectives [Basi93]. Example Metrics include those identified by Carnegie Melon University's Software Engineering Institute (SEI) as initial core measures [CMU92] and the DoD Core Metrics, including size, effort, defects, and schedule.

Usage

Output on Activity A11 (Define Objectives) in C11
tunneled into C11
Appears in C11 in Breakdown Metrics, Objectives:: Risks, Objectives, Metrics
Output on Activity A112 (Identify Metrics) in C17
Output on Activity A11 (Define Objectives) in C17

Metrics, Objectives, Risks

See Metrics, Objectives, and Risks.

Usage

tunneled into C11
Input on Activity A13 (Define Reengineering Project Plan) in C11
Appears in C11 in Breakdown Metrics, Objectives:: Risks, Objectives, Metrics
Input on Activity A13 (Define Reengineering Project Plan) in C15
Input on Activity A131 (Develop Reengineering Strategy) in C15
Input on Activity A134 (Produce Reengineering Project Plan) in C15
Input on Activity A132 (Identify Methodologies and Tools) in C15

New or Reengineered System

One or more products of the Develop or Reengineer Systems activity. See also Reenigneered System.

Usage

Output on Activity A3 (Develop or Reengineer Systems) in C18
Input on Activity A4 (Transition to Operation & Maintenance) in C18
Input on Activity A5 (Implement, Operate & Maintain) in C18

Objectives

Objectives for using the system include performance issues from a user's perspective and the user interface. The objectives for supporting the system include improvements in maintenance and extending life expectancy. The objectives of utilizing reengineering technology include proof-of-concepts and identification of risks.

Objectives are viewed as input and not output, since these are desired goals of the reengineering effort which are subject to change based on actual implementation of reengineering technology. Objectives may also be functional or technical requirements that are to be implemented or met (as performance issues) in the Reengineered System. How these Objectives are addressed during the reengineering is determined as part of the Reengineering Project Plan. Recommended Changes to Objectives are derived from the Objectives.

Usage

Control on Activity A12 (Identify Baseline) in C14
Control on Activity A121 (Identify Existing Application Software) in C14
Control on Activity A122 (Identify Existing Data) in C14
Control on Activity A123 (Identify Existing Technical Infrastructure) in C14
Output on Activity A111 (Develop Objectives & Success Factors) in C17
Input on Activity A113 (Identify Risks) in C17
Input on Activity A112 (Identify Metrics) in C17
Output on Activity A11 (Define Objectives) in C17
Output on Activity A11 (Define Objectives) in C11
Control on Activity A12 (Identify Baseline) in C11
Appears in C11 in Breakdown Metrics, Objectives:: Risks, Objectives, Metrics

Operational Experience

Evidence obtained from the conduct of all defense activities, cinluding successes and failures in military operations, that represent the factual basis for assessing and improving the direction that guides Defense activities [DoD94].

Usage

Output on Activity A5 (Implement, Operate & Maintain) in C18
Input on Activity A1 (Perform Functional Process Improvement) in C18
Input on Activity A4 (Transition to Operation & Maintenance) in C18

Other Models

Representations which reflect commonality and reuse opportunities in a group of similar systems identified as part of a particular mission. These representations include such things as descriptions of the business area, data items, objects, business rules, and the organization of data items and objects by business rules to create products. There are many examples of these, two of which are functional area models and domain models.

Usage

tunneled into C1
Control on Activity A0 (Reengineer System) in C1
Control on Activity A0 (Reengineer System) in C10
Control on Activity A1 (Define Project) in C10
Control on Activity A2 (Reverse Engineer) in C10
Control on Activity A3 (Forward Engineer) in C10
Control on Activity A1 (Define Project) in C11
Control on Activity A11 (Define Objectives) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C11
Control on Activity A2 (Reverse Engineer) in C12
Control on Activity A21 (Analyze Documentation) in C12

Control on Activity A22 (Analyze Application Software) in C12
Control on Activity A23 (Analyze Data) in C12
Control on Activity A24 (Analyze Technical Infrastructure) in C12
Control on Activity A25 (Reconcile Extracted Products) in C12
Control on Activity A3 (Forward Engineer) in C13
Control on Activity A31 (Analyze) in C13
Control on Activity A13 (Define Reengineering Project Plan) in C15
Control on Activity A131 (Develop Reengineering Strategy) in C15
Control on Activity A11 (Define Objectives) in C17
Control on Activity A111 (Develop Objectives & Success Factors) in C17

Portfolio Analysis

A high-level study of the AIS which may be performed to define the Objectives.

Usage

None

Process Model

A graphical and textual representation for organizing the data and processes into manageable groups to facilitate their shared use and control throughout the organization. This representation provides a framework for identifying, defining, and organizing business strategies, business rules, and processes needed to manage and support the way an organization does or wants to do business. Process Models include the logical, physical, and/or normalized models.

Ref.: DoD 5000 11-M, DoD Data Administration Procedures, Department of Manual, June 1991.

Usage

None

Project Resources

The resources for this reengineering project, including personnel, computer resources, and tools. These resources must remain within the constraint of Resource Limitations.

Usage

Output on Activity A133 (Allocate Resources) in C15
Input on Activity A134 (Produce Reengineering Project Plan) in C15

Project Team

The personnel who will perform the reengineering effort form a team. The members of this team may include, but are not limited to experts in the following areas: software/system engineering, technical infrastructure, function/mission of the system domain, users of the application software, and reengineering technology. Specifically, the Project Team should involve the functional customer as much as possible throughout the reengineering effort.

Usage

tunneled into C1
Mechanism on Activity A0 (Reengineer System) in C1
Mechanism on Activity A0 (Reengineer System) in C10
Mechanism on Activity A1 (Define Project) in C10
Mechanism on Activity A2 (Reverse Engineer) in C10
Mechanism on Activity A3 (Forward Engineer) in C10
Mechanism on Activity A1 (Define Project) in C11
Mechanism on Activity A11 (Define Objectives) in C11
Mechanism on Activity A12 (Identify Baseline) in C11
Mechanism on Activity A13 (Define Reengineering Project Plan) in C11
Mechanism on Activity A2 (Reverse Engineer) in C12
Mechanism on Activity A21 (Analyze Documentation) in C12
Mechanism on Activity A22 (Analyze Application Software) in C12
Mechanism on Activity A23 (Analyze Data) in C12
Mechanism on Activity A24 (Analyze Technical Infrastructure) in C12
Mechanism on Activity A25 (Reconcile Extracted Products) in C12
Mechanism on Activity A3 (Forward Engineer) in C13
Mechanism on Activity A31 (Analyze) in C13
Mechanism on Activity A32 (Design) in C13
Mechanism on Activity A33 (Build) in C13
Mechanism on Activity A34 (Integrate) in C13
Mechanism on Activity A35 (Test and Evaluate) in C13
Mechanism on Activity A12 (Identify Baseline) in C14
Mechanism on Activity A121 (Identify Existing Application Software) in C14
Mechanism on Activity A122 (Identify Existing Data) in C14
Mechanism on Activity A123 (Identify Existing Technical Infrastructure) in C14
Mechanism on Activity A13 (Define Reengineering Project Plan) in C15
Mechanism on Activity A132 (Identify Methodologies and Tools) in C15
Mechanism on Activity A133 (Allocate Resources) in C15
Mechanism on Activity A134 (Produce Reengineering Project Plan) in C15
Mechanism on Activity A131 (Develop Reengineering Strategy) in C15
Mechanism on Activity A11 (Define Objectives) in C17
Mechanism on Activity A111 (Develop Objectives & Success Factors) in C17
Mechanism on Activity A112 (Identify Metrics) in C17
Mechanism on Activity A113 (Identify Risks) in C17

Proposed Methodologies and Tools

The proposed methodologies and tools for implementing the Reengineering Project Strategy. The Proposed Methodologies and Tools are defined by Available Reengineering Technology according to the characteristics of the Baseline Automated Information System and must be within available resources as determined by Allocate Resources.

Usage

Output on Activity A132 (Identify Methodologies and Tools) in C15
Input on Activity A131 (Develop Reengineering Strategy) in C15
Input on Activity A133 (Allocate Resources) in C15

Recommended Changes to Baseline

Recommended Changes to Baseline are suggested by the Produce Reengineering Project Plan activity. These changes scope the reengineering effort by suggesting an alternative baseline. These changes usually result from limitations resulting from the Project Strategy, Project Resources, and Proposed Methodologies and Tools. These changes may impact the software, data, or technical infrastructure of the baseline.

The Develop Reengineering Project Plan may send Recommended Changes to Baseline based on information in the Project Plan Revisions (Reverse Engineered Products and the Analysis Deliverables).

Usage

Output on Activity A13 (Define Reengineering Project Plan) in C11
Input on Activity A12 (Identify Baseline) in C11
Input on Activity A12 (Identify Baseline) in C14
Input on Activity A121 (Identify Existing Application Software) in C14
Input on Activity A122 (Identify Existing Data) in C14
Input on Activity A123 (Identify Existing Technical Infrastructure) in C14
Output on Activity A134 (Produce Reengineering Project Plan) in C15
Output on Activity A13 (Define Reengineering Project Plan) in C15

Recommended Changes to Controls

Recommended changes to specific controls on this activity resulting from experience and knowledge gained by performing reengineering. These controls may include any of the following: Regulations, Policy, Standards, and Guidelines, Other Models, Technical Architectures, and DoD Enterprise Model.

Recommended changes to Regulations, Policy, Standards, and Guidelines may include information describing the impact of certain regulations, policy, standards, and guidelines on reengineering which may necessitate modification or clarification of these controls.

Recommended changes to Other Models may include new business practices uncovered during reverse engineering which may necessitate clarification or enhancement to these models.

Recommended changes to Technical Architectures may include lessons learned when utilizing the technical architectures during reengineering which may necessitate clarification or modification to these architectures.

Recommended changes to the DoD Enterprise Model may include information gathered during the reengineering process which supports the DoD Enterprise Model or broadens its use.

Usage

Output on Activity A0 (Reengineer System) in C1
tunneled into C1
Output on Activity A1 (Define Project) in C10
Output on Activity A2 (Reverse Engineer) in C10
Output on Activity A3 (Forward Engineer) in C10
Output on Activity A0 (Reengineer System) in C10
Output on Activity A13 (Define Reengineering Project Plan) in C11
Output on Activity A1 (Define Project) in C11
Output on Activity A25 (Reconcile Extracted Products) in C12
Output on Activity A2 (Reverse Engineer) in C12
Output on Activity A31 (Analyze) in C13
Output on Activity A32 (Design) in C13
Output on Activity A33 (Build) in C13
Output on Activity A34 (Integrate) in C13
Output on Activity A35 (Test and Evaluate) in C13
Output on Activity A3 (Forward Engineer) in C13
Output on Activity A131 (Develop Reengineering Strategy) in C15
Output on Activity A132 (Identify Methodologies and Tools) in C15
Output on Activity A134 (Produce Reengineering Project Plan) in C15
Output on Activity A13 (Define Reengineering Project Plan) in C15

Recommended Changes to Objectives

Recommended Changes to Objectives are suggested by the Develop Reengineering Project Plan activity and result from attempts to adequately address these Objectives in the Reengineering Project Plan. These changes usually result from limitations resulting from the Project Strategy, Project Resources, and Proposed Methodologies and Tools.

The Develop Reengineering Project Plan may send Recommended Changes to Objectives based on information in the Reverse Engineered Products, Analysis Deliverables, metrics, and risks.

Recommended Changes to Objectives are derived directly from the Objectives.

Usage

Output on Activity A13 (Define Reengineering Project Plan) in C11
Input on Activity A11 (Define Objectives) in C11
Output on Activity A134 (Produce Reengineering Project Plan) in C15
Output on Activity A13 (Define Reengineering Project Plan) in C15
Input on Activity A11 (Define Objectives) in C17
Input on Activity A111 (Develop Objectives & Success Factors) in C17

Recommended Product Revisions

Recommended Product Revisions are generated during the Reconcile Extracted Products activity when an inconsistency is detected between one or more of the following: Extracted Documentation Products, Extracted Software Products, Extracted Data Products, and Extracted Technical Infrastructure Products. These inconsistencies must be corrected before these products can be considered Reverse Engineered Products.

Usage

Output on Activity A25 (Reconcile Extracted Products) in C12
Input on Activity A21 (Analyze Documentation) in C12
Input on Activity A22 (Analyze Application Software) in C12
Input on Activity A23 (Analyze Data) in C12
Input on Activity A24 (Analyze Technical Infrastructure) in C12

Reengineered System

The reengineered system is generated from the reengineering activities described within this model. It consists of software, data, technical infrastructure, test results, and all associated documentation.

Usage

Output on Activity A0 (Reengineer System) in C1

tunneled into C1
Output on Activity A3 (Forward Engineer) in C10
Output on Activity A0 (Reengineer System) in C10
Output on Activity A35 (Test and Evaluate) in C13
Output on Activity A3 (Forward Engineer) in C13

Reengineering Project Plan

The Reengineering Project Plan documents the Objectives, identifies the Baselined AIS Components, the Project Resources, and Project Strategy. This plan includes refined feasibility analysis results, risk analysis/management information, and a formalization of the Business Requirements for the Reengineered System. The requirements available in the Baselined AIS Components are confirmed through the reverse engineering process and those to be implemented during forward engineering are identified as part of the Analysis Deliverables.

The Reengineering Project plan defines the Objectives and depicts how the reengineering will meet these objectives. The Plan includes critical success factors and markers for proving these factors were achieved. The Plan also outlines how the Business Requirements map to the specified requirements for the reengineered system.

Usage

Output on Activity A1 (Define Project) in C10
Control on Activity A2 (Reverse Engineer) in C10
Control on Activity A3 (Forward Engineer) in C10
Output on Activity A13 (Define Reengineering Project Plan) in C11
Output on Activity A1 (Define Project) in C11
Control on Activity A2 (Reverse Engineer) in C12
Control on Activity A21 (Analyze Documentation) in C12
Control on Activity A22 (Analyze Application Software) in C12
Control on Activity A23 (Analyze Data) in C12
Control on Activity A24 (Analyze Technical Infrastructure) in C12
Control on Activity A25 (Reconcile Extracted Products) in C12
Control on Activity A3 (Forward Engineer) in C13
Control on Activity A31 (Analyze) in C13
Control on Activity A32 (Design) in C13
Control on Activity A33 (Build) in C13
Control on Activity A34 (Integrate) in C13
Control on Activity A35 (Test and Evaluate) in C13
Output on Activity A134 (Produce Reengineering Project Plan) in C15
Output on Activity A13 (Define Reengineering Project Plan) in C15

Reengineering Project Strategy

Description of how the automated information system will be reengineered. The Reengineering Project Strategy includes the identification and integration of reengineering methodologies into a cohesive strategy for accomplishing the organizational goals of the reengineering project. The strategy drives the identification and utilization of tools to automate the reengineering. The strategy also identifies and describes a risk mitigation strategy and the structure of the products expected from the reengineering. This strategy also includes certification procedures for evaluating the Test Results during the Test & Evaluate activity.

The Reengineering Project Strategy identifies reengineering alternatives which include scenarios, possible incorporation of new technology and approaches, and the use of methodologies and tools. Possible scenarios include, but are not limited to restructuring, redocumentation, and data rationalization.

Usage

Output on Activity A131 (Develop Reengineering Strategy) in C15
Input on Activity A133 (Allocate Resources) in C15
Control on Activity A132 (Identify Methodologies and Tools) in C15
Input on Activity A134 (Produce Reengineering Project Plan) in C15

Regs,Policy,Stds,Guidelines

Documents containing the principle rules designed for governing and influencing decisions and actions during software engineering activities. There are many such documents, two of which are the Software Reengineering Risks Taxonomy and the Information Systems Criteria for Applying Software Reengineering.

Usage

tunneled into C1
Control on Activity A0 (Reengineer System) in C1
Control on Activity A0 (Reengineer System) in C10
Control on Activity A1 (Define Project) in C10
Control on Activity A2 (Reverse Engineer) in C10
Control on Activity A3 (Forward Engineer) in C10
Control on Activity A1 (Define Project) in C11
Control on Activity A11 (Define Objectives) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C11
Control on Activity A2 (Reverse Engineer) in C12
Control on Activity A21 (Analyze Documentation) in C12
Control on Activity A22 (Analyze Application Software) in C12
Control on Activity A23 (Analyze Data) in C12
Control on Activity A24 (Analyze Technical Infrastructure) in C12
Control on Activity A25 (Reconcile Extracted Products) in C12
Control on Activity A3 (Forward Engineer) in C13
Control on Activity A31 (Analyze) in C13
Control on Activity A32 (Design) in C13
Control on Activity A33 (Build) in C13

Control on Activity A34 (Integrate) in C13
Control on Activity A35 (Test and Evaluate) in C13
Control on Activity A13 (Define Reengineering Project Plan) in C15
Control on Activity A134 (Produce Reengineering Project Plan) in C15
Control on Activity A11 (Define Objectives) in C17
Control on Activity A111 (Develop Objectives & Success Factors) in C17
Control on Activity A112 (Identify Metrics) in C17
Control on Activity A113 (Identify Risks) in C17

Regulations, Policy, Standards, Guidelines

See Regs, Policy, Stds, Guidelines.

Usage

None

Repositories

A mechanism for storing and retrieving information or reusable assets. Examples of repositories include the Defense Software Repository System (DSRS), DoD Data Repository System (DDRS), Integrated Computer-Aided Software Engineering (I-CASE), and DoD IDEF Repositories. The DDRS and the DSRS are managed by the CIM Data Administration Program Office and the Reuse Program Office respectively. The DoD IDEF Repository is managed by the CIM Center for Expertise in FPI. Repository-based technology may also be used to store and retrieve information generated during the reengineering project, including Reverse Engineered Products and the Reengineered System components.

Usage

tunneled into C1
Mechanism on Activity A0 (Reengineer System) in C1
Mechanism on Activity A0 (Reengineer System) in C10
Mechanism on Activity A1 (Define Project) in C10
Mechanism on Activity A2 (Reverse Engineer) in C10
Mechanism on Activity A3 (Forward Engineer) in C10
Mechanism on Activity A1 (Define Project) in C11
Mechanism on Activity A12 (Identify Baseline) in C11
Mechanism on Activity A13 (Define Reengineering Project Plan) in C11
Mechanism on Activity A11 (Define Objectives) in C11
Mechanism on Activity A2 (Reverse Engineer) in C12
Mechanism on Activity A22 (Analyze Application Software) in C12
Mechanism on Activity A23 (Analyze Data) in C12
Mechanism on Activity A21 (Analyze Documentation) in C12
Mechanism on Activity A25 (Reconcile Extracted Products) in C12
Mechanism on Activity A3 (Forward Engineer) in C13
Mechanism on Activity A31 (Analyze) in C13
Mechanism on Activity A32 (Design) in C13

Mechanism on Activity A33 (Build) in C13
Mechanism on Activity A34 (Integrate) in C13
Mechanism on Activity A35 (Test and Evaluate) in C13
Mechanism on Activity A12 (Identify Baseline) in C14
Mechanism on Activity A121 (Identify Existing Application Software) in C14
Mechanism on Activity A122 (Identify Existing Data) in C14
Mechanism on Activity A123 (Identify Existing Technical Infrastructure) in C14
Mechanism on Activity A13 (Define Reengineering Project Plan) in C15
Mechanism on Activity A131 (Develop Reengineering Strategy) in C15
Mechanism on Activity A132 (Identify Methodologies and Tools) in C15
Mechanism on Activity A134 (Produce Reengineering Project Plan) in C15
Mechanism on Activity A11 (Define Objectives) in C17
Mechanism on Activity A111 (Develop Objectives & Success Factors) in C17
Mechanism on Activity A112 (Identify Metrics) in C17
Mechanism on Activity A113 (Identify Risks) in C17

Resource Limitations

Estimated limitations on available resources, including manpower, funding, scheduling deadlines, computer resources, and skill levels for performing the reengineering.

Usage

tunneled into C1
Control on Activity A0 (Reengineer System) in C1
Control on Activity A0 (Reengineer System) in C10
Control on Activity A1 (Define Project) in C10
Control on Activity A1 (Define Project) in C11
Control on Activity A11 (Define Objectives) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C15
Control on Activity A133 (Allocate Resources) in C15
Control on Activity A11 (Define Objectives) in C17
Control on Activity A111 (Develop Objectives & Success Factors) in C17
Control on Activity A113 (Identify Risks) in C17
Control on Activity A112 (Identify Metrics) in C17

Reusable Assets

Reusable assets are software work products, including source code, documentation, designs, test data, tools, and specifications. Reusable assets are stored in repositories and should be explored for use throughout the software reengineering effort.

Usage

tunneled into C1
Input on Activity A0 (Reengineer System) in C1
Input on Activity A0 (Reengineer System) in C10
Input on Activity A2 (Reverse Engineer) in C10
Input on Activity A3 (Forward Engineer) in C10
Input on Activity A1 (Define Project) in C10
Input on Activity A2 (Reverse Engineer) in C12
Input on Activity A22 (Analyze Application Software) in C12
Input on Activity A23 (Analyze Data) in C12
Input on Activity A3 (Forward Engineer) in C13
Input on Activity A31 (Analyze) in C13
Input on Activity A32 (Design) in C13
Input on Activity A33 (Build) in C13
Input on Activity A34 (Integrate) in C13
Input on Activity A35 (Test and Evaluate) in C13
Input on Activity A1 (Define Project) in C11
Input on Activity A11 (Define Objectives) in C11
Input on Activity A13 (Define Reengineering Project Plan) in C11
Input on Activity A13 (Define Reengineering Project Plan) in C15
Input on Activity A131 (Develop Reengineering Strategy) in C15
Input on Activity A134 (Produce Reengineering Project Plan) in C15
Input on Activity A132 (Identify Methodologies and Tools) in C15
Input on Activity A11 (Define Objectives) in C17
Input on Activity A111 (Develop Objectives & Success Factors) in C17
Input on Activity A113 (Identify Risks) in C17
Input on Activity A112 (Identify Metrics) in C17

Reverse Engineered Products

Products resulting from the reverse engineering effort which are used in the forward engineering process. These products include, but are not limited to the business rules, refined feasibility analysis results, updated risk analysis, design model, system specification, functional requirements, metric data, data models, process models, design decisions. Reverse engineered products reveal the business requirements fulfilled by the existing AIS.

The Reverse Engineered Products also provide information to the Define Project activity which impacts the Reengineering Project Plan. All of the business requirements implemented in the existing AIS may not be known at the start of the reengineering effort. The business rules fulfilled in the existing AIS are determined as a result of the Reverse Engineer activity. The Reverse Engineered Products are provided to the Define Project activity for updating the Reengineering Project Plan.

Usage

Output on Activity A2 (Reverse Engineer) in C10
Input on Activity A1 (Define Project) in C10
Input on Activity A3 (Forward Engineer) in C10
Input on Activity A1 (Define Project) in C11

tunneled into C11
Appears in C11 in Breakdown Analysis Del., Rev :: Reverse Engineere, Analysis Delivera
Output on Activity A25 (Reconcile Extracted Products) in C12
Output on Activity A2 (Reverse Engineer) in C12
Input on Activity A3 (Forward Engineer) in C13
Input on Activity A31 (Analyze) in C13
Input on Activity A32 (Design) in C13
Output on Activity A3 (Develop or Reengineer Systems) in C18
Input on Activity A1 (Perform Functional Process Improvement) in C18
Input on Activity A2 (Perform Technical & Economic Analysis) in C18

Revision to Project Resources

Recommended changes to the Project Resources based on constraints from Regulations, Policy, Standards, and Guidelines or an inability to reconcile these Resources to the Reengineering Strategy and/or Methodologies and Tools.

Usage

tunneled into C15
Input on Activity A133 (Allocate Resources) in C15
Appears in C15 in Breakdown Revisions to Projec:: Revision to Proje, Revision to Propo, Revision to Reeng

Revision to Proposed Methodologies and Tools

Recommended changes to the Selected Methodologies and Tools based on constraints from Regulations, Policy, Standards, and Guidelines or an inability to reconcile the Methodologies and Tools to the Project Budget and/or Reengineering Project Strategy.

Usage

tunneled into C15
Input on Activity A132 (Identify Methodologies and Tools) in C15
Appears in C15 in Breakdown Revisions to Projec:: Revision to Proje, Revision to Propo, Revision to Reeng

Revision to Reengineering Strategy

Request for a revision to the Reengineering Strategy based on constraints from Regulations, Policy, Standards, and Guidelines or an inability to reconcile the Reengineering Strategy to the Project Budget and/or Methodologies and Tools.

Usage

tunneled into C15
Input on Activity A131 (Develop Reengineering Strategy) in C15
Appears in C15 in Breakdown Revisions to Projec:: Revision to Proje, Revision to Propo, Revision to Reeng

Revisions to Project Plan

See individual definitions for Revisions to Project Resources, Revisions to Proposed Methodologies and Tools, and Revisions to Reengineering Strategy.

Usage

Output on Activity A134 (Produce Reengineering Project Plan) in C15
tunneled into C15
Appears in C15 in Breakdown Revisions to Projec:: Revision to Proje, Revision to Propo, Revision to Reeng

Risks

The Software Reengineering Risks Taxonomy cites several definitions for risk and outlines a taxonomy for identifying and categorizing software reengineering risks. For the purposes of this Model, a risk is defined as a description of any event which may jeopardize the success of the reengineering project if it occurs. Each risk should be identified, and plans outlined to mitigate this risk should it occur.

Usage

Output on Activity A113 (Identify Risks) in C17
Output on Activity A11 (Define Objectives) in C17
Output on Activity A11 (Define Objectives) in C11
tunneled into C11
Appears in C11 in Breakdown Metrics, Objectives:: Risks, Objectives, Metrics

Technical Architectures

Representation of the structure of technical infrastructure components, including computer platforms, support software, and communications; their relationships and interactions.

Usage

tunneled into C1
Control on Activity A0 (Reengineer System) in C1
Control on Activity A0 (Reengineer System) in C10
Control on Activity A1 (Define Project) in C10
Control on Activity A3 (Forward Engineer) in C10
Control on Activity A1 (Define Project) in C11

Control on Activity A11 (Define Objectives) in C11
Control on Activity A13 (Define Reengineering Project Plan) in C11
Control on Activity A3 (Forward Engineer) in C13
Control on Activity A31 (Analyze) in C13
Control on Activity A32 (Design) in C13
Control on Activity A13 (Define Reengineering Project Plan) in C15
Control on Activity A131 (Develop Reengineering Strategy) in C15
Control on Activity A11 (Define Objectives) in C17
Control on Activity A111 (Develop Objectives & Success Factors) in C17
Control on Activity A113 (Identify Risks) in C17

Technical Improvement Opportunities

Technical Improvement Opportunities may result from technology changes identified in the Perform Technical & Economic Analysis activity.

Usage

Output on Activity A2 (Perform Technical & Economic Analysis) in C18
Input on Activity A1 (Perform Functional Process Improvement) in C18

Technical Infrastructure

The basic facilities, equipment and installations needed for the function of a system [DoD92b]. See also Existing Technical Infrastructure.

Usage

None

Technical Requirements

Technical Requirements are those technical changes identified in the Perform Technical & Economic Analysis activity which are designated for the New or Reengineered Systems.

Usage

Output on Activity A2 (Perform Technical & Economic Analysis) in C18
Input on Activity A3 (Develop or Reengineer Systems) in C18

Test Results

Required documentation summarizing the results of the testing phase. Refer to DOD-STD-2167A, the proposed DOD-STD-498 and subsequent standards for guidelines on producing these documents.

Usage

Output on Activity A35 (Test and Evaluate) in C13
Input on Activity A31 (Analyze) in C13
Input on Activity A32 (Design) in C13
Input on Activity A33 (Build) in C13
Input on Activity A34 (Integrate) in C13

Tools

Automated and manual implements used to improve productivity in performing or accomplishing the activities. These tools should integrate into the sponsoring organization's software engineering environment. Several organizations currently support tool evaluation and should be contacted to support the selection of tools appropriate for the individual needs of the reengineering project.

Reengineering tools can be described in several categories, including:

project management
restructuring
reverse engineering
  source code analyzers
  design recovery
  redocumentation
forward engineering
  code generators
  requirements analysis
  design support tools
  test case generators
  integration support tools

Usage

tunneled into C1
Mechanism on Activity A0 (Reengineer System) in C1
Mechanism on Activity A0 (Reengineer System) in C10
Mechanism on Activity A1 (Define Project) in C10
Mechanism on Activity A2 (Reverse Engineer) in C10
Mechanism on Activity A3 (Forward Engineer) in C10
Mechanism on Activity A1 (Define Project) in C11
Mechanism on Activity A11 (Define Objectives) in C11
Mechanism on Activity A12 (Identify Baseline) in C11
Mechanism on Activity A13 (Define Reengineering Project Plan) in C11
Mechanism on Activity A2 (Reverse Engineer) in C12
Mechanism on Activity A21 (Analyze Documentation) in C12
Mechanism on Activity A22 (Analyze Application Software) in C12
Mechanism on Activity A23 (Analyze Data) in C12
Mechanism on Activity A24 (Analyze Technical Infrastructure) in C12

Mechanism on Activity A25 (Reconcile Extracted Products) in C12
Mechanism on Activity A3 (Forward Engineer) in C13
Mechanism on Activity A31 (Analyze) in C13
Mechanism on Activity A32 (Design) in C13
Mechanism on Activity A33 (Build) in C13
Mechanism on Activity A34 (Integrate) in C13
Mechanism on Activity A35 (Test and Evaluate) in C13
Mechanism on Activity A12 (Identify Baseline) in C14
Mechanism on Activity A121 (Identify Existing Application Software) in C14
Mechanism on Activity A122 (Identify Existing Data) in C14
Mechanism on Activity A123 (Identify Existing Technical Infrastructure) in C14
Mechanism on Activity A13 (Define Reengineering Project Plan) in C15
Mechanism on Activity A133 (Allocate Resources) in C15
Mechanism on Activity A134 (Produce Reengineering Project Plan) in C15
Mechanism on Activity A131 (Develop Reengineering Strategy) in C15
Mechanism on Activity A132 (Identify Methodologies and Tools) in C15
Mechanism on Activity A11 (Define Objectives) in C17
Mechanism on Activity A111 (Develop Objectives & Success Factors) in C17
Mechanism on Activity A112 (Identify Metrics) in C17
Mechanism on Activity A113 (Identify Risks) in C17

Transition Plan & Training

The Transition Plan & Training provides a plan to Implement, Operate & Maintain the New or Reengineered System; and to provide adequate training for this transition to succeed.

Usage

Output on Activity A4 (Transition to Operation & Maintenance) in C18
Input on Activity A5 (Implement, Operate & Maintain) in C18

APPENDIX A ACRONYMS

This Appendix A contains an alphabetic listing of acronyms in this document. The number in parenthesis following each entry is the first page number where the acronym is used and defined in the document. The Model Glossary may also contain acronyms which are not shown below and are defined in the text of the Glossary.

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ACRONYMS

DISA (ii) - Defense Information Systems Agency

JIEO (ii) - Joint Interoperability Engineering Organization

CIM (ii) - Center for Information Management

CFSW (ii) - Center for Software

OASD (ii) - Office of the Assistant Secretary of Defense

C^3I (ii) - Command, Control, Communications, and Intelligence

FFRDC (ii) - Federally Funded Research and Development Centers

DTIC (iv) - Defense Technical Information Center

AIS (1-1) - Automated information system

IM (1-1) - Information Management

FPI (1-3) - Functional Process Improvement

ICAM (1-5) - Integrated Computer-aided Manufacturing

IDEF (1-5) - ICAM Definition Language

IDEF0 (1-5) - IDEF for function modeling

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APPENDIX B ICOM MATRICES

This Appendix B contains an ICOM Matrix for each diagram in the Model. The Matrix provides a quick reference for identifying the inputs, controls, outputs, and mechanisms for each activity on a diagram. The first column in each matrix contains the names of the Concepts. The second column identifies the ICOMs for the parent activity. The subsequent columns identify the ICOMS for each lower-level activity on the diagram.

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Appendix B ICOM Matrices

	Activities:	Reengineer System (A0)
Concepts:		
Automated Information System		I
Available Reengineering Technology		C
Business Requirements		I
Candidate Reuse Assets		O
Comp/Comm Infrastructure		M
DoD Enterprise Model		C
Feasibility Analysis Results		I
Methodologies		M
Other Models		C
Project Team		M
Recommended Changes to Controls		O
Reengineered System		O
Regs,Policy,Stds,Guidelines		C
Repositories		M
Resource Limitations		C
Reusable Assets		I
Technical Architectures		C
Tools		M

	Activities:	Define Project (A1)	Reverse Engineer (A12)	Forward Engineer (A13)
Concepts:				
Analysis Deliverables				O
Automated Information System	I	I		
Available Reengineering Technology	C	C		
Baselined AIS Components		O	I	
Business Requirements	I	I	I	I
Candidate Reuse Assets	O	O	O	O
Comp/Comm Infrastructure	M	M	M	M
DoD Enterprise Model	C	C	C	C
Feasibility Analysis	I	I		
Methodologies	M	M	M	M
Other Models	C	C	C	C
Project Team	M	M	M	M
Recommended Changes	O	O	O	O
Reengineered System	O			O
Reengineering Project Plan		O	C	C
Regs,Policy,Stds,Guidelines	C	C	C	C
Repositories	M	M	M	M
Resource Limitations	C	C		
Reusable Assets	I	I	I	I
Reverse Engineered Products		I	O	I
Technical Architectures	C	C		C
Tools	M	M	M	M

	Activities:	Define Objectives (A11)	Identify Baseline (A12)	Define Reengineering Project Plan (A123)
Concepts:				
Analysis Del., Rev Eng Products				I
Analysis Deliverables	I			O
Automated Information System	I	I	I	
Available Reengineering Technology	C	C	C	C
Baselined AIS Components	O		O	I
Business Requirements	I	I	I	I
Candidate Reuse Assets	O	O	O	O
Comp/Comm Infrastructure	M	M		
DoD Enterprise Model	C	C		C
Feasibility Analysis	I	I	I	I
Methodologies	M	M	M	
Metrics		O		
Metrics,Objectives,Risks				I
Objectives		O	C	
Other Models	C	C		C
Project Team	M	M	M	M
Recommended Changes to Baseline			I	O
Recommended Changes to Controls	O			O
Recommended Changes to Objectives		I		O
Reengineered System	O		C	O
Reengineering Project Plan	O			O
Regs,Policy,Stds,Guidelines	C	C		C
Repositories	M	M	M	M
Resource Limitations	C	C		C
Reusable Assets	I	I		I
Reverse Engineered Products	I			
Risks		O		
Technical Architectures	C	C		C
Tools	M	M	M	M

	Activities:	Develop Objectives & Success Factors (A111)	Identify Metrics (A112)	Identify Risks (A113)
Concepts:				
Automated Information System	I	I		
Available Reengineering Technology	C	C	C	C
Business Requirements	I	I		
Candidate Reuse Assets	O	O	O	O
Comp/Comm Infrastructure	M	M	M	M
DoD Enterprise Model	C	C		
Feasibility Analysis	I	I		
Methodologies	M	M	M	M
Metrics	O		O	
Objectives	O	O	I	I
Other Models	C	C		
Project Team	M	M	M	M
Recommended Changes	I	I		
Regs,Policy,Stds,Guidelines	C	C	C	C
Repositories	M	M	M	M
Resource Limitations	C	C	C	C
Reusable Assets	I	I	I	I
Risks	O			O
Technical Architectures	C	C		C
Tools	M	M	M	M

	Activities:	Identify Existing Application Software (A121)	Identify Existing Data (A122)	Identify Existing Technical Infrastructure (A123)
Concepts:				
Automated Information System	I	I	I	I
Available Reengineering Technology	C	C	C	C
Baselined AIS Components	O			
Business Requirement	I	I	I	I
Candidate Reuse Assets	O	O	O	O
Existing Application Software		O		
Existing Data			O	
Existing Technical Infrastructure				O
Feasibility Analysis	I	I	I	I
Methodologies	M	M	M	M
Objectives	C	C	C	C
Project Team	M	M	M	M
Recommended Changes to Baseline	I	I	I	I
Reengineered System	C	C	C	C
Repositories	M	M	M	M
Tools	M	M	M	M

Activities:	Develop Reengineering Strategy (A131)	Identify Methodologies and Tools (A132)	Allocate Resources (A133)	Produce Reengineering Project Plan (A134)
Concepts:				
Analysis Del., Rev Eng Products	I	I		
Available Reengineer Technology	C		C		
Baselined AIS Components	I	C	C		
Business Requirements	I				I
Candidate Reuse Assets	O	O			O
DoD Enterprise Model	C	C			
Feasibility Analysis	I	I	I	I	I
Metrics,Objectives,Risks	I	I	I		I
Other Models	C	C			
Project Team	M	M	M	M	M
Proposed Methodlogie		I	O	I	
Recommended Changes to Baseline	O	O	O		O
Recommended Changes to Controls	O				O
Recommended Changes to Objectives	O				O
Reengineering Project Plan	O				O
Reengineering Project Strategy		O	C	I	I
Regs,Policy,Stds,Guidelines	C				C
Repositories	M	M	M		M
Resource Limitations	C			C	
Reusable Assets	I	I	I		I
Revision to Project				I	
Revision to Proposed Methodologies and Tools			I		
Revision to Reengineering Strategy		I			
Revisions to Project Resources					O
Technical Architectures	C	C			
Tools	M	M	M	M	M

Activities:	Analyze Documentation (A21)	Analyze Data (A22)	Analyze Application Software (A23)	Analyze Technical Infrastructure (A24)	Reconcile Extracted Products (A25)
Concepts:					
Baselined AIS Components	I	I	I	I	I	
Business Requirements	I					I
Candidate Reuse Assets	O					O
Comp/Comm Infrastructure	M				M	
DoD Enterprise Model	C	C	C	C	C	C
Feasibility Analysis						
Extracted Data Products			O			I
Extracted Documentation Products		O				I
Extracted Software Products				O		I
Extracted Technical Infrastructure Products					O	I
Methodologies	M	M	M	M		
Other Models	C	C	C	C	C	C
Project Team	M	M	M	M	M	M
Recommended Changes to Controls	O					O
Recommended Product Revisions		I	I	I	I	O
Reengineering Project Plan	C	C	C	C	C	C
Regs,Policy,Stds,Guidelines	C	C	C	C	C	C
Repositories	M	M	M	M		M
Resource Limitations	M	M	M	M	M	M
Reusable Assets	I	I	I			
Reverse Engineered Products	O					O
Tools	M	M	M	M	M	M

Concepts:	Activities:	Analyze (A31)	Design (A32)	Build (A33)	Integrate (A34)	Test (A35)
Analysis Deliverables	O	O	O	O	O	O
Automated Information System						
Build Components				O	I	I
Build Results			I	O		
Business Requirements	I	I				
Candidate Reuse Assets	I	I	I	I	I	I
Comp/Comm Infrastructure	O	O	O	O	O	O
Design Components			O	I		
Design Results		I	O			
DoD Enterprise Model	M				M	M
Integrated Component					O	I
Integration Results				I	O	
Feasibility Analysis						
Methodologies	M	M	M	M	M	M
Other Models	C	C				
Project Team	M	M	M	M	M	M
Recommended Changes to Controls	O	O	O	O	O	O
Reengineered System	O					O
Reengineering Project Plan	C	C	C	C	C	C
Regs,Policy,Stds,Guidelines	C	C	C	C	C	C
Repositories	M	M	M	M	M	M
Resource Limitations						
Reusable Assets	I	I	I	I	I	I
Reverse Engineered Products	I	I	I			
Technical Architectures	C	C	C			
Test Results		I	I	I	I	O
Tools	M	M	M	M	M	M